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HAWAIIAN FUNGI

BY

FRANK LINCOLN STEVENS

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Dr. F. L. Stevens, Professor of Plant Pathology in the University of Illinois, was Bishop Museum Fellow in Yale University for the year 1921-22. The papers on Hawaiian Fungi were submitted at intervals from 1922-23 and were revised and put in the present form by the author in 1924.

Issued October, 1925.

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HAWAIIAN FUNGI

By F. L. Stevens

INTRODUCTION

The present publication is the result of an effort to unite into one list fungi known to exist on the Hawaiian islands. The larger part of the list represents collections that I made during a period of four and a half months in the year 1921, while serving as a Bishop Museum Fellow of Yale University.

Previous collections, aside from those of fungi growing upon economic plants, had not been large. Reichardt (153) in 1877 reported ten species of Hawaiian fungi, being part of a botanical collection of Dr. Wawra made during the years 1868-1873. In 1895 A. A. Heller (81) collected on the islands of Hawaii about 500 species of plants, 22 of which were fungi. Several of these, and three not included in the sets, were described as new species by Ellis and Everhart in two publications (58).

Charles N. Forbes, botanist of the Bishop Museum for twelve years, an indefatigable collector of flowering plants and an enthusiastic and able botanist, collected a few fungi, some of which were left undetermined in the Museum collections, while thirty-nine species of the higher fungi were sent away for determination, most of them to C. G. Lloyd.

Dr. H. L. Lyon, since 1907 plant pathologist of the Hawaiian Sugar Planters' Association, submitted a collection of approximately 100 specimens of fungi to George F. Atkinson for determination. Those determined gave a total of 58 species. In addition R. Thaxter made a report in 1917 on the Laboulbeniaceae of the Territory and A. T. Speare (172) reports on four other entomogenous fungi.

It thus appears that, aside from the fungous pests of important economic plants and the entomogenous fungi, less than 130 species of fungi had been identified as occurring in the Hawaiian islands (including Palmyra) and very few of these had been recorded in any publication.[1] Aside from the records indicated above, the fungi affecting economic plants have been intensively studied and reported on by the botanists of the Hawaiian

[1] Since this paper was written and while the manuscript was awaiting publication, an article entitled, "Higher fungi of the Hawaiian islands" has been published by E. A. Burt (Ann. Mo. Bot. Garden. 10:179-189, April, 1923), based on Basidiomycetes that were collected by me and in part taken from the Bishop Museum and submitted to Dr. Burt by me. These collections comprised 150 numbers belonging to 61 species.

Sugar Planters' Association and of the Hawaii Agricultural Experiment Station (federal). The fungi of the crop plants are therefore well known.

In preparing these studies I have incorporated all information given in the publications mentioned above and with the exception of certain of the higher fungi that were sent to me by Dr. E. A. Burt for determination and separate report (see footnote 1) have used, in so far as they were useable, all collections of fungi in the Bishop Museum, the Hawaii Agricultural Experiment Station and in Dr. Lyon's private collection, which he very generously placed at my disposal.

In studies of the superficial fungi, such as the Perisporiaceae and Capnodiaceae, brilliant surface lighting under the objective of the microscope by means of the Silverman illuminator has been exceedingly serviceable, giving details of surface structure of perithecia, setae, etc., such as could otherwise not have been secured. With these surface fungi the method of securing mounts by means of the celloidin drop (178) has also been of great service, enabling the retention of the mycelium of colonies in the normal positions. Microtome sections have been made in the case of most of the internal fungi, particularly in the order Dothideales.

My own collections of fungi in Hawaii number something over 1200. They represent many collecting trips in many and diverse regions on Oahu; one three-day collecting trip on Kauai spent chiefly in the region of Kokee; and one week on Maui, the collecting being chiefly in the wet forest along the Olinda pipeline and on Pogue's ditch trail. One month was spent on Hawaii, motoring entirely around the island and collecting at many places, the most interesting and productive of which were the regions near Kilauea, in Kona, and near Waimea.

The work of so brief a period could not result in complete collections from any one region, much less from all the islands. The Hawaiian Territory presents great diversity of humidity and temperature even in the accessible regions to say nothing of the inaccessible cliffs and gorges. Still I regard the results as fairly representative of the Hawaiian fungous flora. The rusts, smuts, and black superficial fungi and truly parasitic fungi have been, perhaps, especially in mind and this has doubtless led to greater degree of completeness of these collections, though many more of each will reward exhaustive search. The higher fungi have been less thoroughly taken and the fleshy agarics have been almost ignored.

I wish to express my thanks to the University of Illinois for the leave of absence which made the trip possible, also for financial assistance from the Graduate School. Both the success and the pleasure of the trip were due to most hearty co-operation of the many kind friends made in Hawaii.

I am particularly indebted to Albert F. Judd, President of the Board of Trustees of the Bishop Museum, for assistance in arranging itineraries and for introductions to many hospitable, delightful people of the islands, who did much to aid me in collecting; to Dr. Herbert E. Gregory for his hearty co-operation in extending to me every facility of the Bishop Museum; and to Dr. H. L. Lyon for similar courtesies at the Sugar Planters' Experiment Station. I wish also to record my appreciation of most helpful assistance on the island of Hawaii from Mr. Julian Monsarrat of Kapapala Ranch; from Mr. Thomas C. White in Kona, and Mr. J. W. Waldron at Waimea and Kukuihaele; and on the island of Maui from Mr. Henry A. Baldwin and Mr. Worth Aiken. I am especially indebted to Mr. Charles S. Judd, Territorial Forester, for many courtesies. The naming of host plants was attended with considerable difficulty for one unfamiliar with a region so unique as Hawaii, and the assistance of Mr. Otto H. Swezey was invaluable to me in preliminary determinations. All determinations in so far as possible were verified by comparison with specimens in the Bishop Museum herbarium. Such comparison usually rendered certain the genus of the host plant, but for many fungi accurate determination of the host species was impossible. All of the grasses were very kindly determined for me by Mrs. Agnes Chase. Other host determinations are acknowledged in the text. Specimens credited to Forbes-Stevens were found in the Museum herbarium on hosts collected by Forbes for the host, and not for the fungus. The segregation of the fungi I made, but the numbers given with them are the original numbers of Forbes. All collections unless otherwise recorded were made by me in the year 1921, and all determinations are mine unless otherwise indicated. Specimens of my collection are deposited in the herbaria of the institutions where the various groups were studied and also when sufficient material was available in the herbarium of the Bishop Museum and in that of the University of Illinois.

In the preparation of these studies I have been aided by the various members of the graduate school, in Botany, of the University of Illinois as follows: P. A. Young, E. F. Guba, P. A. Glick, G. C. Curran, H. L. Dixon, and O. A. Plunkett, also by my technician Amy G. Weedon. The paper on the Microthyriaceae, Stigmataceae and Polystomellaceae was submitted by Ruth W. Ryan in partial fulfilment of the requirements for the degree of Master of Science in Botany in the graduate school of the same University 1923, while that on the Capnodiaceae was similarly submitted by José M. Mendoza. The text regarding the genus Questieria was prepared by Prof. M. Arnaud of Montpellier, France, and several determinations and descriptions were made by Prof. H. Sydow of Berlin, Germany. The smuts were examined by G. P. Clinton, who also made contributions

to the text. Miss Mary E. Currie kindly determined the Myxomycetes. All determinations of the rusts, unless otherwise stated, were made by J. C. Arthur, who has also very kindly read my final rust manuscript and offered many valuable suggestions. The line drawings of the Meliolas and of the Dothideales are by L. R. Tehon, and all photographs by A. G. Eldridge. I am greatly indebted to Miss Helen A. Purdy, Bishop Museum Fellow, for the preparation of the Bibliography and to Miss Elizabeth B. Higgins for editorial criticism. Assistance in spelling of Hawaiian place names has been given by Dr. Harold L. Lyon and other friends in Honolulu.

[The responsibility for the spelling of scientific names and for the arrangement and verification of keys and indexes rests with the author.—Editor.]

MYXOMYCETES [2]

The few species of Myxomycetes here reported are merely incidental collections made in trips, the primary object of which was to collect parasitic fungi. They are all well known and cosmopolitan in their distribution. According to Forbes (61) "Our knowledge of the Mycetozoa is limited to six species," but I fail to find a record of these six. The number to record in Hawaii could doubtless be very much increased by a little special search for Slime Molds.

MYCETOZOA

Rostafinski Sluzowce (Mycetozoa) Monographia (Paris: 1875).

A. Lister, A monograph of the Mycetozoa, London, 1911.

SUB-CLASS II ENDOSPOREAE

AMAUROSPORALES

PHYSARACEAE

1. **FULIGO** Haller, Hist. Stirp. Helv., vol. 3, p. 110, 1768

No. 1. **Fuligo septica** Gmelin, Syst. Nat., p. 1466, 1791.

On dead stump. Oahu: Hakipuu, June 19, no. 561.

On grass and fern. Oahu: Honolulu, School St., June 1, 1917, Lyon, no. 131.

On dead stump and dead Eucalyptus leaf. Hawaii: Kukuihaele, Aug. 2, no. 1093.

[2] The determinations of the Myxomycetes were made by Mary E. Currie.

This species commonly fruits on grass and low herbs and its occurrence in fruit on a living fern is of note. Though there is much variation within the species, it is very easily recognized, and is cosmopolitan in its distribution. Sometimes its fruits smother the living plants.

No. 2. **Fuligo cinerea** Morg. (Jour. Cin. Soc. Nat. Hist., vol. 19, p. 105, 1896.) var. **escorticata** Lister.

On dead wood. Maui: Olinda pipeline, Sept. 5, no. 1137.

This species is not uncommon and has been collected in the eastern and western United States.

STEMONITACEAE

2. STEMONITIS Gleditsch, Meth. Fung. p. 140, 1753

No. 3. **Stemonitis splendens** Rost. (Mono. p. 195, 1875), var. **flaccida** Lister. (See Pl. 11, *E*.)

On dead wood. Kauai: Kalalau trail, June 16, no. 475.

This specimen is of special interest on account of the comparative rarity of the variety. The capillitium which differs slightly from the type is shown in Plate 11, *E*. It has been reported from the British Isles and from several of the United States.

LAMPROSPORALES

LYCOGALACEAE

3. LYCOGALA Adanson, Fam. Pl., vol. 2, p. 7, 1763

No. 4. **Lycogala epidendrum** Fries, Syst. Myc., vol. 3, p. 80, 1829.

On dead wood. Oahu: Olympus, June 24, no. 710—Hawaii: Kealakekua, July 23, no. 951, and July 25, no. 1008. Also in the Bishop Museum as determined by C. G. Lloyd.

It is a species which shows little variation except in size, and is probably the commonest and most cosmopolitan in its distribution of all Myxomycetes.

ARCYRIACEAE

4. ARCYRIA Wiggers, Fl. Holsat., p. 109, 1780

No. 5. **Arcyria cinerea** Pers. Syn. Fung., p. 184, 1801

On *Metrosideros polymorpha*. Hawaii: Kealakekua, July 21, no. 954.

This is a common species, very often occurring in large quantities, and is readily recognized.

PHYCOMYCETES

Saprolegniales

5. PYTHIUM Pring. Jahr. Wiss. Bot., vol. 1, p. 304, 1858

No. 6. **Pythium butleri** Subra., Mem. Dept. Agr. India, vol. 10, p. 181, 1919

On *Saccharum officinarum.* (cane) Reported by C. W. Carpenter (31) as the cause of root rot (Lahaina disease).

On *Ananas sativus.* (pineapple), Oahu; Kailua, reported by Carpenter (31).

On *Oryza sativa* (rice), reported by Carpenter (31).

No. 7. **Pythium sp.**

On *Colocasia sps.* (taro), reported by Carpenter (31) as cause of root rot.

Other references to *Pythium sp.,* or to pythium-like fungi, associated with root rot of rice, cane, banana or taro are to be found in articles by Carpenter (29) and also by Caum (34) who says "several undetermined species are reported as parasitic on the roots (cane).

Peronosporales

ALBUGINACEAE

6. ALBUGO (Pers.) S. F. Gray, Nat. Arr. Brit. Pl., vol. 1, p. 540, 1821.

Cystopus Lev. Ann. Sci. Nat., 3d ser; vol. 8, p. 371, 1847.

This genus though common in temperate regions, seemed rare in Hawaii. No cosporic material was found.

No. 8. **Albugo candida** (Pers.) Kuntze, Rev. Gen. Pl., vol. 2, p. 58, 1891
Cystopus candidus Lév. Op. cit.

On *Sinapis cernua* "kai choy." Oahu: Between Diamond Head and King St., Honolulu, May 19, no. 17; Hawaii: Keauhou, Kona, Bishop Estate road, July 23, no. 938. Reported also by Carpenter (29, Rep. 1918). Collected also at Honolulu, October 3, 1917, Carpenter no. 167; Manoa, Lyon, Sept. 20, 1909.

On *Brassica campestris.* (turnip) Carpenter (29, Rep. 1918, p. 44).

No. 9. **Albugo ipomoea-panduranae** (Schw.) Swing. Jour. Myc., vol. 7, p. 112, 1891

Cystopus ipomoea-panduranae Stev. and Swing. Trans. Kans. Acad. Sci., vol. II, p. 67, 1889.

On *Ipomoea insularis*. Oahu: Honolulu, Beretania St., May 18, no. 4—Hawaii, Kukuihaele, August 2, no. 1102.

PERONOSPORACEAE

7. PHYTOPHTHORA De Bary, Jour. Roy, Agr. Soc., vol. 12 p. 240, 1876.

No. 10. **Phytophthora colocasiae** Rac. Par. Alg. Pilze Javas, vol. 1, p. 9, 1900

On *Colocasia sp.* (taro) Oahu: Molokai, and Hawaii, C. W. Carpenter (29, Rep. 1919).

No. 11. **Phytophthora infestans** (Mont.) De Bary, Jour. Roy. Agr. Soc. vol. 12, p. 240, 1876

On *Solanum tuberosum.* (potato), widely prevalent (29). Reported by Carpenter in Hawaii (29, Rep. 1918; 30); Maui and Oahu (29, Rept. 1917).

Other specimens were collected as follows: May, 1913, by L. D. Larsen; Maui, Waiakoa, 1916, and Oahu, 1917, by C. W. Carpenter.

On *Lycopersicum esculentum* (tomato), Carpenter, C. W. (29, Rep. 1918).

Mucorales

MUCORACEAE

8. RHIZOPUS Ehrenb. Nova Acta Acad. Leop., vol. 10, pt. 1, p. 198, 1820.

No. 12. **R. nigricans** Ehrenb.

On *Ipomoea batatas*. Reported as "Rhizopus sp." by Carpenter but undoubtedly this species.

Entomophthorales

ENTOMOPHTHORACEAE

9. ENTOMOPHTHORA Fres. Bot. Zeit., vol. 14, p. 883, 1856

No. 13. **Entomophthora sp.**

On *Perkinsiella saccharicida* (cane leaf-hopper). Recorded by A. T. Speare (172).

No. 14. **Entomophthora pseudococci** Speare
On *Pseudococcus sacchari.* Recorded by Speare (172).

10. METARRHIZIUM Giard, Bull. Fr. Belg., vol. 12, p. 217, 1889

No. 15. **Metarrhizium anisopliae** (Metsch.)
On *Adoretus sinicus, Anomala orientalis, Rhabdocnemis obscura, Monocrepidius exsul, Pantomorus fulleri, Gonocephalum seriatum, Plusia chalcites.* Recorded by A. T. Speare (172).

ASCOMYCETES

The collections of ascomycetous fungi from Hawaii are especially rich in the Perisporiales with the Meliolineae perhaps leading in interest. The Hemisphaeriales, Dothideales and Microthyriaceae also present many forms of special interest. The remaining ascomycetous orders, though the number of species reported herein is considerable, still falls far below the number that an equal amount of time devoted to collecting in other regions would afford.

Certain species are included herein since they appear on a list of determinations made by G. F. Atkinson based on fungi collected by Lyon. The list is included in a letter dated September 3, 1909, and the specimens on which it is based were deposited in the herbarium of Cornell University. Some obviously incorrect determinations, as well as several names never published occur in the list. All such are omitted. These which I use are given just as Professor Atkinson listed them, without editing, and are followed by the reference to Atkinson's list.

Numerous other fungi are included because they are listed by Caum as occurring in Hawaii. All such are followed by the reference "Caum."

KEY TO ORDERS OF ASCOMYCETES HEREIN REPORTED

Perithecia not stalked on a receptacle, not on insects
- Ascoma at maturity open and more or less cup-like Discomycetes **Pezizales**
- Ascoma free, asci uncovered, linear **Hysteriales**
- Asci in a cylindrical, globose or dimidiate perithecium
 - Asci arranged at different levels in the perithecium **Aspergillales**
 - Asci from a common level
 - Perithecia globose and without typical ostiole
 - Stromatic **Dothideales**
 - Not stromatic **Perisporiales**
 - Perithecia ostiolate
 - Perithecia dimidiate **Hemisphaeriales**
 - Perithecia not dimidiate
 - Perithecia not dark colored **Hypocreales**
 - Perithecia dark colored **Sphaeriales**

Perithecia on a stalked receptacle, on insects **Laboulbeniales**

Pezizales

KEY TO HAWAIIAN FAMILIES OR GENERA

Peridium and hypothecium of the same tissue **Pezizaceae**
Peridium with a differentiated surface layer
 Peridium pseudo-parenchymatic **Mollisiaceae**
 Peridium pseudo-prosenchymatic **Helotiaceae**
 Paraphyses apically obtuse **Dasyscypha**
 Paraphyses acute **Erinella**

PEZIZACEAE

11. PEZIZA Dill. Nov. Gen. Pl., p. 74, helv. no. 222i, 1719

No. 16. **Peziza gelantinosa** Hall

Atkinson lists as Lyon no. 22 f.

MOLLISIACEAE

12. PSEUDOPEZIZA Fuckel, Symb. Myc., p. 290, 1869

No. 17. **Pseudopeziza medicaginis** (Lib.) Sacc. Fung. Ard. n. 90, Malpighia, vol. 1, p. 455, 1887.

On *Medicago sativa.* Oahu: Waialua, Oct. 10, 1913, L. D. Larsen, Lyon no. 404; Honolulu, April 21, 1913. Lyon no. (?); Wahiawa, 1913. Lyon no. 340.

HELOTIACEAE

13. DASYSCYPHA Fries, Syst. Myc., vol. 2, p. 89, 1822

No. 18. **Dasyscypha sadleriae** Stevens and Young n. sp.

Affected pinnules black, gray, or brown, discolored areas sometimes limited by veinlets. Apothecia 110-260 μ in diameter; hypophyllous, scattered thickly over areas not covered by host sori, borne on short stalks, globose at first, but finally becoming saucer-shaped or flat-topped, white, becoming pink when wet, round or irregular, hairy. Asci clavate, 68-80 by 12-15 μ, 8-spored. Paraphyses filiform, blunt, 50-70 by 1-2μ. Spores hyaline, 1-celled, granular, ends acute, 9-16 by 3-4μ. (See Pl. III, *G.*)

On living leaves of *Sadleria sp.* Hawaii: Hamakua, July 31, no. 1078.

Saccardo describes no species of Dasyscypha on either Sadleria or on Blechnum, a genus closely related to Sadleria. The fungus appears to be actively parasitic, causing well marked diseased spots.

No. 19. **Dasyscypha ulei** (Wint.) Sacc. Syll. Fung., vol. 8, p. 452, 1889

Peziza ulei Winter. Hedwigia, vol. 24, p. 258, 1885.

On living leaves of *Gleichenia longissima.* Oahu: Wahiawa, May 31, no. 153.

On *Gleichenia sp.* Oahu: Konahuanui trail, Nov. 3, 1912, Lyon no. 167, Maui: Pogue's Ditch Trail, Sept. 6, no. 1158.

The characters of the fungus on these fern leaves agree closely with those of the printed description except that the apothecia are light yellow to white instead of red. Well developed diseased spots are produced.

14. ERINELLA Sacc. Syll. Fung., vol. 8, p. 507, 1889

No. 20. **Erinella longispora** Karst. Sacc. Syll. Fung., vol. 8, p. 507, 1889
Lachnum longisporum Karst. Hedwigia, vol. 29, p. 191, 1889.

Lyon no. 26. In Atkinson's list as determined by Durand.

Hysteriales

KEY TO HAWAIIAN GENERA

Spores brown **Rhytidhysterium**
Spores hyaline, filamentous..... **Lophodermium**

15. RHYTIDHYSTERIUM Speg. Anal. Soc. Ci. Argent., 4, no. 191, 1882

No. 21. **Rhytidhysterium prosopidis** Peck Rept. 46, N. Y. State Mus. Nat. Hist. p. 39, 1893

On *Prosopis juliflora.* Oahu: Honolulu, 1913. Lyon no. 406.

16. LOPHODERMIUM Chev. Fl. Gen. Env. Paris, vol. 1, p. 436, 1826

No. 22. **Lophodermium intermissum** Starb. Bih. S v. Vet.-Acad. Handl., vol. 21, p. 17, 1895

On *Acacia koa.* Oahu: Wahiawa, June 3, no. 234; Maui: Pogue's ditch trail, Sept. 6, no. 1156.

The present form is provisionally placed under this species with the description of which it agrees closely, though its agreement with *L. arundinacium* is also very close, notwithstanding that the latter is on a monocotyledonous plant, while the present form is on a dicotyledonous one.

No. 23. **Lophoderium arundinaceum** (Schrad.) Chev. Fl. Gen. Env., Paris, vol. 1, p. 435, 1826

On *Vincentia angustifolia.* Oahu: Wahiawa, June 3, no. 246; Palolo valley and Mt. Olympus, June 10, no. 373, and June 24, no. 727; Tantalus, June 22, nos. 652 and 622.

The present form is placed under this species after careful comparison with herbarium specimens. (Rabenhorst, Fungi Europaei, no. 1226).

No. 24. **Lophoderium sacchari** Lyon, H.S.P.A. Exp. Sta., Rec., vol. 9, p. 601, 1913

On *Saccharum officinarum* (cane) Hawaii, 1913, Lyon no. 291.

"On dead leaves of *Saccharum officinarum*. Hawaii." Caum.

Aspergillales

17. ASPERGILLUS Mich. Nova Pl. Gen., p. 212, 1729

No. 25. **Aspergillus parasiticus** Speare

On *Pseudococcus sacchari*. Recorded by A. T. Speare.

Dothideales

Lindau, in E. & P., Nat. Pfl., vol. 1, Abt. 1, p. 373, 1897

My previous collecting experience, in the Caribbean tropics, included numerous species of Dothideales, which, by their conspicuous character and abundant distribution, were in marked contrast to the collections of Dothideales of Hawaii, where, although the eye was trained to recognize them, they were found only rarely and in inconspicuous form. Notwithstanding this sparseness of species the forms that were found are for the most part of exceptional interest both in their morphology and as throwing light upon phylogeny. The series of three forms described below on Cibotium shows a very remarkable differentiation to have occurred on this host. Forms placed here in the Dothideales and forms described elsewhere with the meliolas or with the Microthyriaceae clearly show these groups to merge into each other. In certain of the dothids, though sub-cuticular or subepidermal, the habit of multiple anchorage or penetration into the mesophyll similar to that shown by the Polystomellaceae is found, though no sign of radiate structure appears. It is probable that certain of the superficial Microthyriaceae, by some such steps as are represented by Meliola-Amazonia-Actinodothidopsis, have led to a group of superficial dothids. On the other hand the same fungi or others have emphasized their host attachment, developed a powerful hypostroma and in fact changed from the superficial habit, as of the Polystomellaceae, to the subcuticular or subepidermal habit of the dothids.

KEY TO HAWAIIAN GENERA OF DOTHIDEALES

Stromata palisade-formed, superficial or erumpent **Dothideaceae**
Stromata superficial, centrally fastened **Coccoideae**
Spores 1-celled, hyaline 18. **Yoshinagella**
Stromata superficial, fastened at many places **Leveillelleae**
Spores, 4-celled, brown 19. **Pauahia**

Stromata subcuticular or subepidermal **Phyllachoraceae**
Stromata between cuticle and epidermis **Trabutiineae**
Spores 1-celled, hyaline, paraphyses present 20. **Trabutia**
Spores 1-3 celled, hyaline 21. **Actinodothidopsis**
Stromata between epidermis and palisade tissue **Scirrhiineae**
Spores 1-celled, hyaline, appendaged 22. **Schizochora**
Spores 2-celled, hyaline,
Cells equal 23. **Scirrhia**
Cells unequal 24. **Apiospora**
Stromata in the mesophyll **Phyllachorineae**
Spores 1-celled, hyaline, paraphyses present 25. **Phyllachora**
Spores 2-celled, hyaline, paraphyses absent 26. **Oligostroma**
No definite stroma; loculi isolated in the mesophyll **Montagnellaceae**
27. **Hyalocurreya**

DOTHIDEACEAE Nitschke, emend. Theis. and Syd.
Ann. Myc., vol. 13, p. 174, 1915

Coccoideae

18. YOSHINAGELLA v. Höhn, in Sitzungsber. K. Akad. Wiss. Wien., vol. 122, p. 36, 1913

No. 26. **Yoshinagella polymorpha** Lyon (in lit.) n. sp[3].

Stromata erumpent, emerging naked and black, and soon becoming stipitate and setose. Setae usually arranged as a crown, but rarely completely covering the stroma, long, 600-850 μ, black, stiff, septate; setal tips obtuse, or sometimes swollen to knobs.

Asci about 14—160 by 9 μ, 8 spored. Paraphyses filamentous.

Spores uniseriate or inordinate, continuous, hyaline, oblong, 14-18 by 7-9 μ, dilute green. Conidia small, 4-5 by 3 μ, 1-celled, irregularly ovate to pyriform, slightly fuscous, borne on long, simple conidiophores. (See Pl. I, *A, B, E, F, G;* fig. 1, *a, b, c, d.*)

On living leaves of *Cibotium menziesii.* Oahu: Olympus, June 24, no. 694 (type); Castle trail, 1912, Lyon no. 165; Palolo valley, 1912, Lyon nos. 142, 433, 468.—Hawaii: Upper ditch trail, July 31, no. 1061; Pahala, 1919, Lyon no. 480.—Kauai: no. 1161, Swezey.

This fungus is fairly constant in its characters. The hypostroma is well developed, reaching more than half the way through the leaf as a rather compact mycelial network. The stroma emerges through the epidermis, first as a minute smooth, globular structure. It soon becomes top-shaped and flat-topped, with a stipe some 275 μ broad, at the same time developing a beautiful corona of black setae (Pl. I, *B, F*). In rare instances the whole top of the stroma is setose. Viewed from above the top of the stroma, the portion encircled by the setae, has a honey-

[3] This name was suggested by H. L. Lyon in a personal letter; the description is by Stevens. I am indebted to Dr. Lyon for opportunity to make preliminary examination of his herbarium specimens and for information as to suitable localities for collecting this fungus.

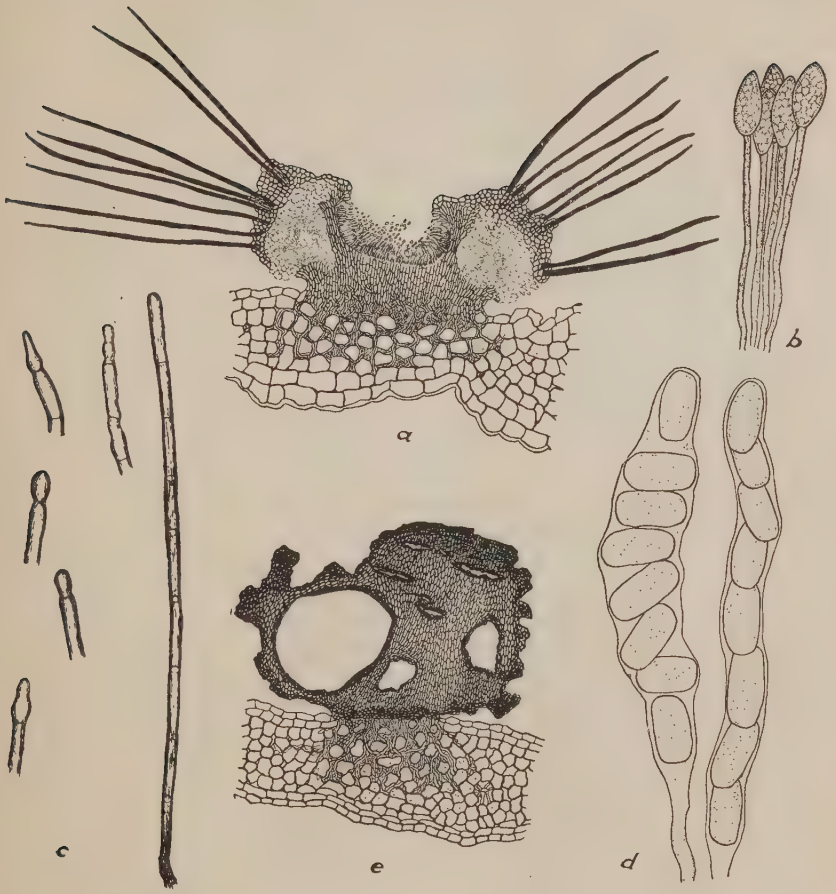


FIGURE 1.—*Yoshinagella: a,* microtome section of a stroma of *Y. polymorpha,* showing the characteristic palisade arrangement of the stroma—the hypostroma penetrates deep into the mesophyl—the origins of the setae from the rim of the stroma, the developing perithecia under the rim of the stroma, and the central cavity lined with conidiophores.—*b-d, Y. polymorpha* (No. 694) on *Cibotium menziesii: b,* conidiophores and conidia; *c,* setae and setal tips; *d,* asci with spores; *e, Yoshinagella nuda* on *Cibotium chamissoi*—section of a stroma.

comb (See Pl. *I, E, F*) appearance and frequently shows also globular protuberances. By crushing the stromata, or still better by use of microtome sections, it appears that in certain stages of development the central portion is concave and conidia-bearing while the border or rim of the disk shows evidence of developing perithecia (fig. *a*). Other stages show the perithecia well developed and filled with asci. (Pl. I, *G*).

No. 27. **Yoshinagella polymorpha** Lyon var. **pauciseta** Stev. n. var. Pl. 1, *C*.

Setae usually few or entirely absent, and when present irregularly arranged and short (90-230 μ). (In very rare instances the stroma showed regular radiating setae.) Stromata small, round, black, not so distinctly stipitate as in *Y. polymorpha.* Pycniospores and all other structures as in *Y. polymorpha.*

On *Cibotium chamissoi.* Hawaii: Hamakua, upper ditch trail, July 31, nos. 1066 and 1077.—Maui: Pogue's ditch trail, Sept. 6, no. 1156.

This variety differs markedly from *Y. polymorpha* in that the setae of the stroma are very few in number or quite lacking (See Pl. 1, *C*), and when present, are very rarely found arranged as a crown on the stroma. The stromata, too, lack the characteristic shape and are merely irregular small cushions, and the conidiiferous and ascigerous parts are not regularly distributed.

No. 28. **Yoshinagella nuda** Stevens n. sp.

Pl. 1, *D, H,* and fig. 1, *e.*

Stromata black, hard, irregular in shape, without setae or rarely with few scattered setae, varying greatly in size from less than a millimeter to more than two centimeters in diameter. Other characters as in *Y. polymorpha.*

On *Cibotium chamissoi.* Oahu: Wahiawa, May 31, nos. 151 and 155; Ahren's ditch trail, June 8, no. 286; Mt. Olympus, June 10, nos. 305, 307, 332, 372; Waiahole ditch trail, June 12, no. 388; Tantalus, June 20, no. 591, and June 22, no. 656; Olympus, June 24, nos. 664 and 701. Also in Lyon's collection as nos. 331 and 419.

This species differs from *Y. polymorpha* in that it is devoid of setae, also the stromata are very large and irregular. It differs in the same way from *Y. polymorpha* var. *pauciseta,* and from this form it is in particular delimited by the striking difference in the size of the stromata. (Compare Pl. 1, *C* with Pl. 1, *D*). In cross section the stromata are seen to be irregular (Pl. 1, *E*) without the stipe found in *Y. polymorpha,* and often without the regular arrangement of ascigerous and conidiiferous regions.

The three forms described above constitute a very interesting series and display remarkable morphological features. Were *Y. polymorpha* to be considered alone, it would clearly be placed in the Coccoideae of the Dothideales, as conceived by Theissen and Sydow (196, vol. 13, p. 265). In this section it would be excluded from the only genera with centrally

fastened stromata; from Trichodothis and Perischizon by its one-celled hyaline spores; from Yoshinagella by its stromatic setae.

When, however, the three forms are considered together it is obvious from their identity of spore and ascus character, and by their occurrence on closely related hosts that they are closely related genetically, and I am of the opinion that the three should be considered as co-generic. Though Yoshinagella is without setae and the absence of setae in it is emphasized in the key of Theissen and Sydow, I believe that the correct procedure is to broaden the conception of that genus, previously known by only one species, by including in it forms with stromatic setae, as I have done.

Though Trichodothis is clearly a separate genus, as is shown by its 2-celled brown spores, it is of interest to note that its stromatic setae closely resemble those of *Y. polymorpha* in these rare instances in which they are setose over the whole upper surface. Comparison of specimens of *Asterina comata* B. & R., the type species of Trichodothis, from the exsiccati (158; 149; 56) show these stromata to be so like the completely setose forms of *Y. polymorpha* that the latter would clearly fall within Trichodothis, except for its spore characters.

Considering the identity of perithecial structure and contents of these three forms, together with the fact that they all occur on Cibotium in Hawaii, it is extremely probable that all descended from a common ancestor parasitic on Cibotium or a closely related host. The collections in hand indicate that *Y. polymorpha* is limited to *C. menzeisii* as a host and that the two other forms occur only on *C. chamissoi,* though this generalization may be broken down when more collections are available. In the present light it appears as though a non-setose race first developed on *C. menzeisii* and that later this gave rise to the less setose, but more aggressively parasitic races.

LEVEILLELLEAE

19. PAUAHIA Stevens n. gen.

Stromata superficial, of perpendicular palisade structure, locules several. Spores brown, 3-septate.

Named in honor of the Princess Bernice Pauahi.

No. 29. **Pauahia sideroxyli** Stevens n. sp.

Stromata black, 2-8 mm. in diameter, 1-2 mm. thick, hypophyllus, rough. Loculi many, 200-215 μ in diameter. Asci evanescent, 2-4 spored, no paraphyses. Spores brown, 61-64 by 21 μ, obtuse, 3-septate, the terminal cells markedly smaller than the others. (See fig. 2.)

On *Sideroxylon rhyncospermum.* Maui: Nahiku, Jan., 1909, Lyon no. 61.

This fungus clearly belongs to the Dothideaceae as emended by Theissen and Sydow, and appears to belong to the section Leveillelleae, though

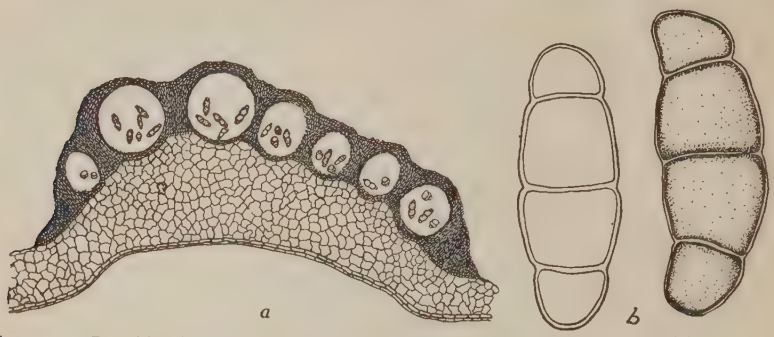


FIGURE 2.—*Pauahia sideroxyli on Sideroxylon rhyncospermum* (Lyon no. 61): *a*, section of a stroma showing locules; *b*, spores.

an intramatricular mycelium was not observed. The septation and color of the spores clearly differentiate this from all other genera.

PHYLLACHORACEAE

TRABUTIINEAE

20. TRABUTIA Sacc. and Roum. Rev. Myc., vol. 3, p. 27, 1881

No. 30. **Trabutia minima** Stevens and Weedon, n. sp.

Spots approximately circular, definite, 3-10 mm. in diameter, often coalescing; epiphyllous. Surface of diseased spot brown to black, covered in the older, central portion by an irregular, radiating white network. Stromata epiphyllus, subcuticular, minute (150 μ in diameter, and 25 μ thick). Perithecia 21-25 μ in diameter, usually with only one ascus, rarely two. Asci oblong or nearly globular, 8-spored, 21 by 14 μ, wall thick, (3 μ). Spores hyaline, 14-16 by 3 μ, obtuse.

On unknown dicotyledonous host, Kauai, June 15, no. 445.



FIGURE 3.—*Trabutia minima* (No. 445): *a*, pycnidial stage; *b*, a stroma showing subcuticular character, the locules, and the mycelial projections between the epidermal cells.

This fungus occurs in large diseased spots (Pl. II, *A*), but these probably are not caused by this fungus; but by some other agency, since no significant mycelial penetration is observed. What appears to be a pycnidial stage also occurs. (See Pl. II. *A;* fig, 3, *a, b.*)

21. ACTINODOTHIDOPSIS Stevens n. gen.

Stroma clypeate, subcuticular, composed of narrow bands of pseudo-parenchymatic structure (not radiate). Perithecia solitary, globular, ostiolate, upper part merging into the clypeus, lower part thin walled. Asci 8-spored, spores 1 to 3-celled, hyaline. Stromata epiphyllus, linear and irregularly arranged, about 150 μ wide, composed of irregularly radiating threads.

No. 31. **Actinodothidopsis coprosmae** Stevens n. sp.

Stromata subcuticular, clypeate, consisting of a compact, black mycelial mass between the cuticle and the epidermal cells, usually about 20 μ thick, numerous, dense, thick, mycelial masses extend downward from the stromata between the epidermal cells and considerable ways into the mesophyll. Locules globose, distinctly ostiolate, 80-150 μ in diameter, often widely separated, developing below the clypeate stromata, between it and the palisade cells; thin-walled on the bottom and sides. Paraphyses filiform. Asci 8-spored, 29-43 by 18μ. Spores 22-25 by 3.5 μ, obtuse, 1-septate (possibly 3-septate), very pale chlorine-green. (See Pl. II, *B;* fig. 4.)

On *Coprosma sp.* Kauai: Waimea canyon, upper pipe trail, June 15, no. 457.



FIGURE 4.—*Actinodothidopsis coprosmae* (No. 457) on Coprosma: *a,* portion of a stroma viewed from above, showing several separate perithecia; *b,* mycelial structure of the edge of a stroma; *c,* showing position of the stroma below the cuticle; *d,* spores; *e,* the clypeate stroma and three locules.

This fungus resembles the Hemisphaeriales in the general character of its stroma, but the perithecium is not dimidiate, but globular, and the stroma is not radiate, though it verges toward radiate character, fig. 4, *b*). In this family its affinities would be nearest to the Stigmateaceae on account of sub-cuticular development, though differing from this group in not

being truly radiate. It differs from the Polystomellaceae as given by Theissen and Sydow (196, vol. 15, p. 399), in that the ascoma is neither superficial nor radial. The fungus also shows relationship with the Clypeosphaeriaceae, a family closely related to the Dothideales as evidenced by the fact that the genus Trabutia and certain species of Anthostomella, formerly placed in the Clypeosphaeriaceae, are now regarded as Dothideaceous. In the Clypeosphaeriaceae our fungus most nearly resembles Hypospila from which it differs in the texture and extent of its clypeate stroma. In the Dothideales as conceived in the monograph of the group by Theissen and Sydow, where the fungus has greatest affinity it differs from the Munkielleae in that the radiate structure is not typical. Here it would fall next to Microdothella from which it differs in having 2-celled spores, also essentially in stromatic characters.

The distinctive characters of this fungus are that its perithecia are produced *below* the clypeus, not *in* a stroma, and that the clypeate stroma is pseudo-radiate. Its relationship, considering all characters, seems to be with the Dothideales, near the Trabutiineae in the Phyllachoraceae.

SCIRRHIINEAE

22. SCHIZOCHORA Syd. Ann. Myc., vol. 11, p. 265, 1914.

No. 32. **Schizochora pandani** Stevens n. sp.

Stromata amphigenus, about 1 mm. in diameter, but often coalescing to form large spots, most abundant near the bases of old leaves. Stromata about 230-310 μ in diameter, surrounded by a narrow dark zone due to the mycelial invasion of the epidermal cells. Surface of the stroma slightly arched, non-ostiolate, spores liberated by the falling away of the whole of the perithecial covering, stromata unilocular. Asci 150-185 μ long, narrow, thin-walled, spores hyaline, uniseriate, but overlapping, fusiform, ending in long, awn-like tips, extreme dimensions 54-61 by 7 μ, either one or two celled. No paraphyses. (See Pl. 11, *D;* fig. 5.)

On *Pandanus odoratissimus.* Oahu: Waiahole ditch trail, June 6, no. 408; Kalihi valley, June 2, no. 187. Only one species of this genus has been described, and that on Fiscus in the Philippines.

The stromata are very minute and either sparsely scattered or very closely placed over the leaf surface. (See Pl. 11, *D.*) Each stroma is normally surrounded by a dark zone, due to the occupied mesophyll. These areas often blend with other similar areas and a comparatively large spot bearing many stromata may result. In microtome section the main part of the stroma is seen to be between the epidermis and the underlying layer of cells; this stroma showing a typical dothideaceous palisade arrangement. (See fig. 2, *a.*) The ascigerous locule is always broad and shallow. The mesophyll is, to considerable depth, well occupied with the dark mycelium of the fungus. The fungus appears to agree in general structure with Schizochora, as figured and described by Sydow, with the exception that it has no paraphyses and that the spores are sometimes 1- septate.

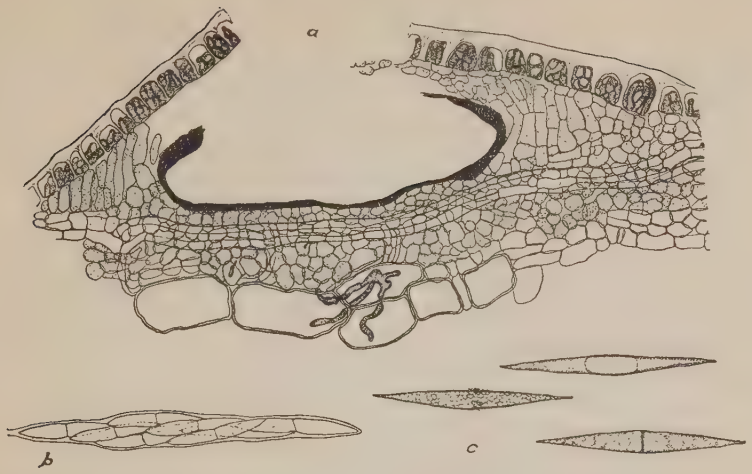


FIGURE 5.—*Schizochora pandani* (No. 408) on *Pandanus odoratissimus: a,* a stroma showing its sub-epidermal development, also the mycelium in the epidermal cells and in the mesophyll; *b,* ascus; *c,* ascospores.

23. **SCIRRHIA** (Nitschke) Fuckel, Symb. Myc., p. 220, 1869

No. 33. **Scirrhia lophodermioides,** El. and Ev. Bull. Torr. Bot. Cl., vol. 22, p. 435, 1895

On dead grass. Heller no. 2368.

24. **APIOSPORA** Sacc. Soc. Veneto-Trentina Sci. Nat., vol. 4, p. 9, 1875

No. 34. **Apiospora montagnei** Sacc.

On *Cortaderia argentea,* Pampas grass. Hawaii, Kealakekua, July 23, no. 933. (See fig. 6, *a.*)

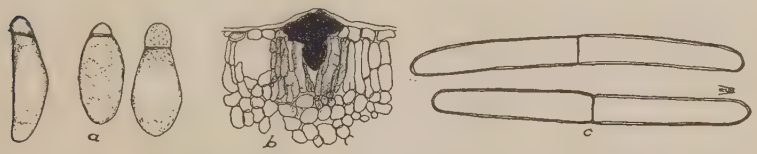


FIGURE 6.—*a, Apiospora montagnei*—ascospores; *b, Oligostroma suttoniae* (No. 868*a*) on *Suttonia lessertiana*—spores and young stroma below the cuticle and extending between the palisade cells; *c, Oligostroma suttoniae*—spores.

This specimen agrees remarkably well with the published descriptions, except that the stromata are frequently somewhat larger (3 mm.) and the ascospores somewhat thicker (up to 11 μ).

PHYLLACHORINEAE

25. PHYLLACHORA (Nitschke) Fuckel, Symb. Myc., p. 216, 1869

No. 35. **Phyllachora freycinetiae** Stevens n. sp.

Spots scattered, small, 2-4 mm. tan colored. (Plate 11, *C.*) Stromata showing from both sides of the leaves, most abundant below. Perithecial cavities large, irregular, often angular, often over 300 μ in diameter, centrally located in the mesophyll. Asci 8-spored, 110 by 7 μ, long, narrow, straight. Spores uniseriate, hyaline, continuous, 7 by 14 μ, oblong, paraphyses filiform, numerous.

On *Freycinetia arnotti.* Oahu: Kalihi valley, June 2, no. 184.

No Phyllachora is recorded on any member of the Pandanaceae.

No. 36. **Phyllachora graminis** (Pers.) Fuckel, Symb. Myc., p. 216, 1869

On *Eragrostis variabilis.* Oahu: Tantalus, June 22, no. 600.

As Theissen and Sydow (196, vol. 13, p. 437) remark, the species *P. graminis,* as now known, is a collective species and much time and study will be required to separate it into its component species. Many species of Phyllachora are now recorded on grasses which by their description are indistinguishable from each other and from *P. graminis.* No Phyllachora appears heretofore to have been noted on Eragrostis. The present species is recorded as above though it could with equal reason be placed in any of the following species, with all of which it agrees sufficiently closely: *P. striatula,* Th. and Syd. on *Axonopus scmialatus; P. caespiticia,* Th. and Syd. on Bambusa; *P. boutelouae,* Rehm, on *Bouteloua curtipendula; P. sphaerosperma* on *Cenchrus echinatus; P. vulgata,* Th. and Syd. on *Muhlenbergia sps; P. paspalicola,* P. Henn, on Paspalum; *P. pogonatheri,* Syd. on *Pogonatherum saccharoideum; P. polypogonis,* Th. and Syd. on *Polypogon crinitus; P. serialis,* Ell. and Ev., on *Spartina stricta; P. cordobensis,* Rehm. on grasses; *P. cynodontis;* (Sacc.) Niessl. on *Cynodon dactylon; P. fuscescens* Speg. on Agrostis.

The following species are also very close, though differing to a somewhat greater degree than these of the foregoing list; *P. olyrae,* Rehm, on Olyra; *P. tricholaenae,* P. Henn., on *Tricholaena rosea.*

It is somewhat remarkable that the present specimens are the only representatives of the genus Phyllachora collected in Hawaii.

26. OLIGOSTROMA Syd. Ann. Myc., vol. 12, p. 265, 1914

No. 37. **Oligostroma suttoniae** Stevens n. sp.

Spots circular, visible from both sides of the leaf, 7-12 mm. in diameter, border indefinite, centers tan-colored. Stromata epiphyllus, small, black, numerous in roughly circular arrangement slightly raised above the leaf surface. Stromata at first in the

epidermis and between it and the palisade cells. Locules located in the palisade region. Asci 8-spored, about 80 μ long. No paraphyses. Spores 1-septate, hyaline, long-cylindrical, straight or slightly crooked, obtuse, 40-43 by 4 μ, pale straw colored. (See fig. 6, *b, c.*)

On *Suttonia lessertiana.* Hawaii: Kilauea, July 16, no. 868a.

Six species only of this genus are recorded by Theissen and Sydow. Our species agrees with none of these, although it is somewhat close to *O. mayteni* (P. Henn.) Th. and Syd. and to *O. mulinicola* (Speg.) Th. and Syd. on Maytentus and Mulinum, respectively.

The stromata develop first in the epidermis, then extend into the palisade region. Mycelium in looser form also reaches into the mesophyll for considerable distance. It is in the palisade region that greatest development occurs and here that the locules form. As the asci mature the stroma above the locule thickens, pressing the cuticle upwards. (See fig. 6.)

MONTAGNELLACEAE Theis. and Syd.

27. **HYALOCURREYA** Theis. and Syd., Ann. Myc., vol. 13, p. 640, 1915
Curreya Sacc. Syll. Fung., vol. 2, p. 651, 1883.

No. 38. **Hyalocurreya sandicensis** (El. and Ev.) Theis. and Syd. Ann. Myc., vol. 13, p. 640, 1915

Curreya sandicensis El. and Ev. Bull. Torr. Bot. Cl., vol. 24, p. 135, 1897

On *Alphitonia ponderosa.* Heller's collection no. 2758, collected on Kauai in 1895 (58, vol. 24, p. 135).

PERISPORIALES

KEY TO HAWAIIAN FAMILIES

Mycelium dark
- Mycelium not slimy, straight walled, net-like **Perisporiaceae**
- Mycelium dematium-like or, if straight-walled, slimy **Capnodiaceae**

Mycelium pale **Erysiphaceae**

PERISPORIACEAE

MELIOLINEAE

It is of interest to note that all the meliolas collected in Hawaii are found on plants indigenous to the islands, and that most of the host species collected are endemic, with large representation on such typically Hawaiian genera as Gouldia, Clermontia, Kadua, Lobelia, Pelea, Scaevola, and Straussia. Consideration of such hosts of the meliolas, as Coprosma, with New Zealand affinities, Acacia with Australian relatives, Scaevola,

Cyrtandra, Pipturus, Gouldia, Metrosideros, and Wikstroemia, kin to South Sea forms, indicates their western origin. Only one host, *Physalis peruviana,* is attributed to American origin. There is indication that the meliola flora is much more ancient than the rust flora (see Uredinales), and that it was dominated from the west, while the younger rust flora shows much more American influence.

The ratio of number of meliola species to number of possible host species in Hawaii and in Porto Rico is as follows:

	VASCULAR HOSTS	MELIOLAS	RATIO
Hawaii	999	34	.034
Porto Rico	2250	103	.046

It is thus seen that the meliolas are approximately 50 per cent more abundant in Porto Rico than in Hawaii.

Since the lowland flora is now largely or quite overrun or even obliterated by encroachment of introduced plants, it is only in the higher elevations that meliolas occur; the lowest altitude at which any was found was above Wahiawa at about 1500 ft. This limitation to higher regions appears to be due, however, to the matter of host distribution rather than to any direct relation between meliolas and climate or altitude, since in Porto Rico meliolas flourished in all altitudes and in all climatic conditions. This relation of the meliolas to the ancient flora of the islands clearly points to their long, even very ancient, association with these hosts or their progenitors.

The meliolas have long been regarded as belonging to the Perisporiales. It appears to me, in view of the frequent possession of a true ostiole and the usual presence of a rudimentary one and still more on consideration of the forms showing a truly radiate ascogenous structure, that they are very closely related to the Microthyriaceae. The genus Meliola as formerly understood has recently been subdivided into several genera, as is shown in the key on page 28. In placing these genera Theissen recognizes the microthyriaceous character of his genus Amazonia, placing it in that family in the sub-family Asterineae, while he places Meliola and Irene in the Perisporiaceae, a grouping necessitated by the thoroughly artificial nature of his classification. The genus Actinodothis is placed in the Dothidiaceae by Sydow. Such separation of genera that are essentially very closely related does not reflect, but really very much obscures, actual relationship. The main argument relied upon by those who advocate separation of the meliolas from the Asterineae is based upon the assertion that the perithecia (thyriothycia) of the Asterinas arise in the so-called "inverse" manner, while the meliolas are said to develop the perithecia

otherwise. Even should this difference in mode of growth be substantiated by conclusive investigation, I do not regard it as of sufficient importance to warrant the wide separation, into separate families, of such genera as Actinodothis, Amazonia, and Meliola.

To bring together again these genera, closely related morphologically and doubtless phylogenetically, I therefore place them in the sub-family Meliolineae of Arnaud (which I shall designate commonly as the meliolas).

The occurrence of the species *Irene puiggarii, Meliola cyperi* and *Amazonia asterinoides,* which are known in such widely separated parts of the world as Africa, South America, and Hawaii, and on plants endemic, or at least not introduced by man, points to very great antiquity of the meliolas and of their parasitic habit. Moreover the occurrence of these forms on many hosts but slightly related and with morphological changes in the meliolas so slight as to be indistinguishable, indicates a remarkable morphological constancy in these forms.

The parasites on the meliolas, which I discussed in an earlier paper in connection with the Porto Rican forms (180, vol. 65) are essentially the same in Hawaii as in Porto Rico. *Arthrobotryum, Helminthosporium,* and certain nectriaceous, microthyriaceous, and other ascigerous and pycnidial parasites, several species of each, appear to be quite the same species on the Hawaiian and Porto Rican specimens. This, too, points strongly to a very ancient existence of this parasitic relation.

The characters exhibited in the various species of the meliolas appear to be remarkably constant, comparatively invariable. The most characteristic features possessed by all meliolas are the dark, coarse, superficial mycelium and the three- to four-septate, brown spores in evanescent asci which bear only two or at most four spores. One line of differention has resulted from either the loss of or the acquisition of the dimidiate-perithecial habit, segregating Amazonia and Actinodothis from the remaining genera.

Hyphopodia are remarkably constant, though in some forms they show tendency to vary in position and shape, and in Meliolina, the most widely divergent of the Hawaiian meliolas, hyphopodia have almost completely disappeared. The loss or acquisition of the habit of producing setae leads to the segregation of the genus Irene.

The ascopores in all of the species are remarkably uniform in size, color, septation, and shape. Only a few species show distinctive features such as mucronate or conic apices or tapering spores. Within given species all characters, and particularly spore size, are much more constant than in most fungi. Segregation of two great groups results from the occurrence of three-septate and four-septate forms. So fixed are species in this

regard that deviation from the mode is never seen, unless in the genus Actinodothis, as recorded by Sydow (187, p. 174).

The character of the tips of the setae, whether uncinate, dentate, branched, or whether acute or obtuse, is one of remarkable constancy, though within a few species there is variation in this character. Although taken as a whole the meliolas show constancy to type, some rather remarkable variation is found. In the species *Actinodothis perrottetiae* and *A. suttoniae* the colonies which are densely crustose may be either with or without capitate hyphopodia, their presence seeming to be dependent upon the degree of crowding of the mycelium in the colony. In *A. perrottetiae* also, though the perithecia are usually dimidate, merely pockets, slightly raised under a flat crust, frequently a pocket continues to grow, resulting in the emergence of a truly spherical, typical Meliola-like perithecium. In *Irene cheirodendronis* the perithecia are at first dimidate and with mature spores. If the colony continues to grow the perithecia become truly globular, thus merging the characters of Irene with those of Amazonia.

The fact that *Amazonia perrottetiae* and *Actinodothis perrottetiae,* two forms very distinct in colony habit,—one dense, crustose, definite, with no free mycelium, the other with loose, lax, indefinite, free mycelium—occur on the same host, and that the two fungi have spores and hyphopodia considerable alike, argues for their common ancestry. Two characteristics, density of colony and form of perithecium, have varied largely, but spores, hyphopodia and host have remained constant.

In view of the facts just recorded, I do not regard the genera as set up in the meliolas to possess any phylogenetic significance; they are merely aids in grouping the forms according to their present morphology.

The two genera Actinodothis and Meliolina differ markedly from other meliolas, each in two important respects. Actinodothis has a distinct, well-developed, superficial stroma and a well-developed hypostroma, both characters indicating relationship with the Dothideales. Meliolina develops no superficial stroma and its superficial mycelium bears only rudimentary, or rather vestigial, capitate hyphopodia. It does, however, show within the host tissue, a larger development of mycelium than is found in any of the other meliolas. Linked with the larger development of internal mycelium in these two genera is naturally found a greater pathogenicity, and the diseased areas associated with these genera are both larger and more pronounced than with other meliolas.

If a typical Meliola be regarded as the ancestral form—all evidence points to great antiquity of Meliola—it is obvious that these two genera illustrate how, by increase in power to invade host tissue accompanied by such morphological changes as these two genera show, two tendencies are

here expressed, which in culmination might give rise to the Dothideaceae on the one hand and to the Parodiellinaceae on the other.

The Hawaiian meliolas, to a remarkable extent, fall into groups of rather closely related forms. Thus in the genera Meliola and Irene there are five distinct groups. The first of these consists of six members which have the formula 3411 or 341 2/3, and contains M. *cyperi*. The second with the formula 311 (with the fourth term 1, 2 or 3) consists of ten members, all endemic. A third group is characterized by divided mycelial setae, formula 3131, and contains *M. palmicola*. A fourth group consists of *M. puiggarii, M. exilis* and *M. spendens*. The fifth group contains *Irene triloba* and *I. inermis* with three other species. It is conceivable, though by no means certain, that these groups indicate the common ancestry of the forms included, and that the form in a group that is known in other lands may represent the most primitive type of the group and its source. Thus a primitive *M. cyperi* may have given rise to the whole group of formula 3411 as it now occurs in Hawaii. It is not probable, however, that the three Amazonias are closely related, since it appears reasonably certain that *Amazonia perrottetiae* and *Actinodothis perrottetiae* are derived directly from a common ancestor. (See p. 26.) Several of the Hawaiian meliolas show distinct evidence of a parasitic habit, causing a diseased spot that shows clearly from both sides of the leaves.

In the following presentation I have adopted the excellent scheme of group numbers originated by Beeli (14), the use of which may be made clear by the following table:

TABLE I.—EXPLANATORY OF THE BEELI SCHEME OF GROUP NUMBERS

DIGIT	REFERS TO	FIGURE	INDICATES
1	Spore septa	2	3-septa
		3	4-septa
2	Perithecium	1	smooth
		2	warts prominent
		3	setae uncinate or spiral
		4	setae not uncinate or spiral
3	Mycelial setae	0	absent
		1	straight
		2	uncinate
		3	dentate
		4	branched
4	Capitate hyphopodia	1	alternate
		2	opposite
		3	alternate or opposite
5	Length of spore	1	20 μ—
		2	30 μ—
		3	40 μ—
		4	50 μ
		5	60 μ—

6	Breadth of spore	1	10 μ—
		2	20 μ—
		3	30 μ—
		4	40 μ—
7	Diameter of perithecium	1	100 μ—
		2	200 μ—
		3	300 μ—
		4	300 μ+
8	Length of setae	1	300 μ—
		2	500 μ—
		3	1000 μ—
		4	1000 μ+

Thus group number 3112.4231 means with 4-septate spores, perithecium smooth, setae straight, capitate hyphopodia opposite, with spores 40 μ or less in length, 20 μ or less in breadth, perithecium 300 μ or less in diameter and setae less than 300 μ long, as is true in *M. koae*.

The number of species of Hawaiian meliolas previously known was 4; the number now known is 34.

The number of hosts previously known was 4; the number now known is 58.

The number of hosts now known would doubtless be much increased if all the hosts could be definitely referred to species rather than merely to genera.

None of these species was on an introduced host. See pp. 174-5.

MELIOLINEAE

KEY TO GENERA

Ascus evanescent, with less than eight spores:
- Perithecium at maturity globose, not dimidiate:
 - Typical hyphopodia always present:
 - Mycelium setose, Nos. 39 to 58 28. **Meliola** Fries
 - Mycelium not setose, Nos. 59 to 66 29. **Irene** Sydow
 - Typical hyphopodia never present Nos. 67-68 30. **Meliolina** Sydow
- Perithecium at maturity typically dimitate:
 - Free mycelium present Nos. 69-71 31. **Amazonia** Theissen
 - Free mycelium not present Nos. 72-73 32. **Actinodothis** Sydow

Ascus persistent, cylindrical, 8-spored **Meliolinopsis** Beeli

28. MELIOLA Fries, Syst. Orb. Veg., p. 62, 1825.

KEY TO THE HAWAIIAN SPECIES OF THE GENUS MELIOLA

Peritheca with setae:
- Capitate hyphopodia mainly opposite No. 39 **M. lobeliae** 3412.4221
- Capitate hyphopodia alternate or opposite No. 40 **M. vaccinii** 3413.4233

[a]Not known in Hawaii.

Capitate hyphopodia mainly alternate:
Colony loose No. 41 **M. kaduae** 3411.3223
Colony dense
Setae acute or obtuse No. 42 **M. alyxiae** 3411.4223
Setae acute
Capitate hyphopodia usually irregularly triangular No. 43 **M. cyperi** 3411.4233
Capitate hyphopodia usually irregularly oblong No. 44 **M. juddiana** 3411.5334
Perithecia without setae:
Mycelial setae simple and entire
Capitate hyphopodia opposite
Typically spherical No. 45 **M. sandwicensis** 3112.3222
Typically oblong
Mycelium typically slightly sinuous No. 46 **M. koae** 3112.4231
Mycelium typically straight No. 47 **M. peleae** 3112-4233
Capitate hyphopodia opposite or alternate:
Mycelium loose, long No. 48 **M. sideroxyli** 3113.3213
Mycelium close, short No. 49 **M. lyoni** 3113-4232
Capitate hyphopodia alternate:
Setae strongly arched No. 50 **M. hawaiiensis** 3111.4221
Setae straight or nearly so
Setae about 200 μ long
Tip acute No. 51 **M. morbosa** 3111.4221
Tip obtuse No. 52 **M. visci** 3111.4231
Setae 280-1000 μ long
Colonies dense, setae abundant, No. 1 No. 53 **M. forbesii** 3111.4223
Colonies less dense, fewer setae No. 54 **M. osmanthi** 3111.4225
Mycelial setae dentate or branched
Capitate hyphopodia opposite No. 55 **M. kauaiensis** 3132.4221
Capitate hyphopodia alternate
Colony dense, almost crustose No. 56 **M. dracaenae** 3131.5321
Colony less dense No. 57 **M. palmicola** 3131-4223

No. 39. **Meliola lobeliae** Stevens n. sp. Fig. 7, *a*.

Fungus amphigenous, more abundant below. Perithecia abundant in the central regions of colonies, globose, 125-185 μ in diameter. Perithecial appendages similar to those of the mycelium, but usually more crooked, arising from the base of the perithecium. Surface of perithecium slightly rough. Spores 4-septate, 35-45 by 14-18 μ, obtuse, but slightly constricted at the septa. Mycelium loose, branching at acute angles. Capitate hyphopodia numerous, mainly opposite, but sometimes alternate; stalk cell short, head cell oblong or globular. Ampulliform hyphopodia opposite or alternate. Mycelial setae sparse, 150-260 μ long, simple, straight, black, 9 μ thick at base, apex obtuse. (See fig. 7, *a*.)

Group number 3412.4221.

On Clermontia. Maui: Iao Valley, Sept. 9, No. 1154 (type); Molokai, Forbes-Stevens, no. 32, Hawaii: Keauhou, Kona, Bishop estate road, July 25, no. 979.

This species falls within the same group as *M. juddiana* and *M. kaduae* but differs from them. No species has heretofore been described on any of the Lobeliaceae.

No. 40. **Meliola vaccinii** Stevens n. sp.

Fungus amphigenous. Colonies 2-3 mm. in diameter. Perithecia abundant in the central regions of old colonies, globose, 150-230 μ in diameter. Perithecial appendages arising from the base of the perithecium, similar to the mycelial setae, but usually shorter and more crooked. Perithecial surface rough, Asci evanescent. Spores 4-septate, 40-50 by 8 μ, obtuse, constricted at the septa. Mycelium crooked, dense, branching irregularly. Capitate hyphopodia numerous, alternate, unilateral or irregularly arranged, sometimes opposite; stalk cell short, head cell nearly oblong or irregular. Ampulliform hyphopodia numerous, mostly opposite, occurring in groups or scattered. Mycelial setae few, long (580 μ), simple, straight, black, 10 μ thick at base, apex obtuse. (See fig. 7, *b*.)

Group number 3413.4233.

On *Vaccinium reticulatum*. Hawaii: Kilauea, July 16, no. 866, July 13, no. 821—Hilo, flow of 1881, July 8, no. 739 (type)—Maui: Olinda pipeline, Sept. 5, no. 1146, Forbes-Stevens, 1916, no. 694.

Five species have been described on the Ericaceae, but each has 3-septate spores. The leaf tissue is discolored, reddened, over an area somewhat larger than the mycelial colony.

No. 41. **Meliola kaduae** Stevens n. sp.

Fungus hypophyllous. Colonies very thin, almost invisible. Perithecia globose, 125-140 μ in diameter. Perithecial surface slightly rough, setae few, short (50-90 μ long), acute. Asci evanescent. Spores 4-septate, 28-40 by 11 μ, obtuse, cylindrical, but slightly constricted at the septa. Mycelium very loose, slender, (5 μ), branching at acute angles. Capitate hypopodia numerous, far apart (36-50 μ), alternate; stalk cell short or long (7 μ), head cell irregular-pyriform. Ampulliform hyphopodia few, opposite or alternate. Mycelial setae long (650 μ), simple, straight or crooked, black, apex acute. (See fig. 7, *c*.)

Group number 3411.3223.

On *Straussia kaduana*. Oahu: Olympus, June 10, no. 335.

On *Straussia sp*. Kauai: Kalalau trail, June 16, no. 483 and no. 511, June 16, no. 512; Oahu: Tantalus, June 22, no. 617.

On *Gouldia terminalis*. Oahu: Tantalus, June 22, no. 604.

On *Gouldia sp*. Oahu: Tantalus, June 22, no. 601 (type), no. 604 and no. 597:

On *Gouldia lanceolata*. Hawaii: Waimea, July 30, no. 1049.

On *Kadua sp*. Oahu: Tantalus, June 22, no. 601a.

M. kaduae falls into classification within the group of *M. circinans*, with both mycelial and perithecial setae—the perithecial setae simple and not spiral nor nodose, but its spores are markedly smaller than any of this group. Of the meliolas described on the Rubiaceae only two have perithecial setae and from these it differs markedly. The mycelium shows very distinctive character.

No. 42. **Meliola alyxiae** Stevens n. sp.

Fungus amphigenous. Colonies 3-15 mm. in diameter, densely black, circular or irregular, scattered, with numerous setae. Perithecia abundant, clustered, globose,

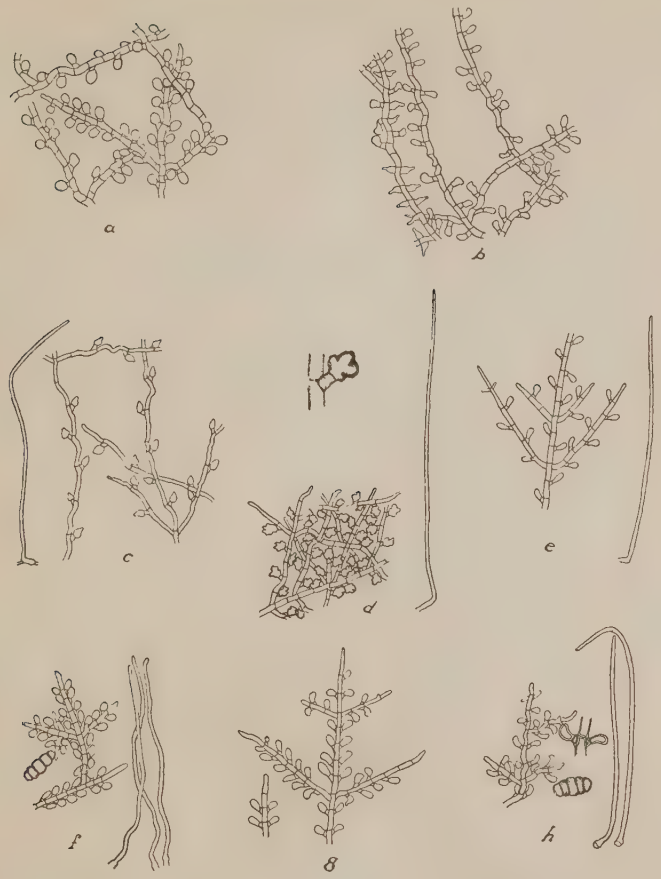


FIGURE 7.—Meliola: *a, Meliola lobeliae* (No. 1154) on *Clermontia sp.*—mycelium showing variation in hyphopodia, some opposite, some alternate; *b, Meliola vaccinii* (No. 866) on *Vaccinium reticulatum*—mycelium and capitate and ampulliform hyphopodia; *c, Meliola kaduae* (No. 601) on *Gouldia sp.*, showing a setum, also the lax, distant hyphopodia; *d, Meliola alyxiae* (No. 1075) on *Alyxia olivaeformis,* showing dense character of colony and the irregular hyphopodia, also a setum; *e, Meliola juddiana* (No. 235) on *Pelea sandwicensis*—mycelium showing opposite branching and alternate hyphopodia, also a mycelial setum; *f, Meliola sandwicensis* (No. 537) on *Gouldia coriacea*—mycelium and hyphopodia, a spore, and setae; *g, M. peleae* (No. 440) on *Pelea barbigera,* showing the comparatively straight mycelium with opposite branching and capitate hyphopodium; *h, Meliola koae* (No. 163) on *Acacia koa*—mycelium and hyphopodia, setae, and a spore.

140-170 μ in diameter, surface quite rough with irregular prominences. Perithecial setae similar to those of the mycelial, but shorter (about 150 μ), arising around the base of the perithecium. Asci evanescent. Spores 4-septate, 46-54 by 14-18 μ, obtuse, much constricted at the septa. Mycelium dense, often very dense and crustose, crooked, branching at acute angles. Capitate hyphopodia numerous, alternate; stalk cell short, head cell angular, several-pointed. Ampulliform hyphopodia rare, scattered. Mycelial setae numerous, 770 μ long, simple, straight or crooked, black, 11 μ thick at base, apex usually acute. (See fig. 7, *d*.)

Group number 3411.4223.

On *Alyxia olivaeformis*. Hawaii: Hamakua, Upper ditch trail, July 31, no. 1062 and no. 1075; Keauhou, Kona, Bishop Estate road, July 25, no. 975; Puna, July 9, no. 756. Kauai: Kalalau trail, June 16, no. 514. Oahu: Wahiawa, June 3, no. 210 and no. 217 (type); Ahren's ditch trail, June 8, no. 409 and no. 985.

On *Vaccinium reticulatum*. Hawaii: Kilauea, July 13, no. 821. The densely matted mycelium and the angular hyphopodia are characteristic. Though some thirteen species have been described on the Apocynaceae none of them has perithecial setae.

N. 43. **Meliola cyperi** Pat. in Gaillard, Le Genre Meliola, p. 70, Paris, 1892. Group number 3411.4233.

On *Vincentia angustifolia*. Oahu: Wahiawa, June 3, no. 196; Tantalus, June 22, no. 603; Palolo Valley, June 10, no. 344; Olympus, June 24, no. 705. Maui: Olinda pipeline, Sept. 5, no. 1144.

On *Gahnia leptostachya*. Oahu: Olympus, June 24, no. 672; Wahiawa, June 3, no. 226; Palolo Valley, June 10, no. 361; Kauai: Pipe trail, Waimea canyon, June 15, no. 435.

On *Gahnia gaudichaudii*. Hawaii: Kilauea, July 17, no. 879.

On *Rhynchospora thyrsoidea*. Kauai: Waimea canyon, Forbes-Stevens, 680.

On *Baumea meyenii*. Oahu: Olympus, June 24, no. 711.

This fungus was reported also by Heller on Cyperaceae, no. 2249.

These specimens agree remarkably closely with Patouillard's original description, drawn from a sedge from Africa, as well as with specimens of my own collected in Porto Rico. The paralleling of the mycelium along the veins is particularly noticeable on Gahnia, much more so than on Vincentia. Old colonies are almost devoid of setae and often weather away in the central portions.

No. 44. **Meliola juddiana** Stevens n. sp.

Fungus amphigenous, more often hypophyllous. Colonies circular, often 5-10 mm. in diameter, black, dense or diffuse, setae numerous. Perithecia abundant in the central regions of large colonies, globose, 260 μ in diameter. Perithecial setae usually arising around the base of the perithecium, short (100-180 μ), strongly

curved, acute. Surface of perithecium rough with prominences which may rarely become elongated. Asci evanescent. Spores 4-septate, 60 by 25 μ, obtuse, slightly constricted at the septa. Mycelium dense, 11 μ thick, branching at acute angles. Branches often opposite. Capitate hyphopodia numerous, alternate; stalk cell short, head cell oblong to irregular. Ampulliform hyphopodia numerous usually opposite and in groups. Mycelial setae long (900-1200 μ) black, simple, straight or slightly curved, 15 μ thick at base, apex acute. Pl. 11, *F;* fig. 7, *e.*

Group number 3411.5334.

On *Pelea hawaiiensis.* Kauai: Pipe trail, Waimea canyon, June 15, no. 441.

On *Pelea elliptica.* Kauai: Kalalau trail, June 16, no. 526.

On *Pelea sp.* Maui: Olinda pipeline, Sept. 5, no. 1148. Oahu: Palolo valley, June 10, no. 297; Olympus, June 24, no. 712 and 704. Hawaii: Keauhou, Kona, July 25, no. 986 (type) and no. 974; Waimea, July 30, no. 1048; Hamakua, upper ditch trail, July 28, no. 1034; collected also by Lyon (Lyon no. 346), Tantalus, May 27, 1913; Kaala, Sept. 7, 1913 (Lyon no. ?). Molokai: Forbes-Stevens, Halawa (no. 483).

On *Pelea rotundifolia.* Oahu: Forbes-Stevens, no. 1328.

On *Pelea clusiaefolia.* Maui: 1910, Forbes-Stevens. Lanai: Munro-Stevens, in 1915.

On *Pelea sandwicensis.* Forbes-Stevens, no. 235, 1920.

On *Pelea parvifolia.* Molokai, Forbes-Stevens, no. 411.

On *Pelea cinerea.* Oahu, Forbes-Stevens, no. 1816, 1912.

This species is named in honor of Mr. Albert F. Judd of Honolulu in recognition of his service to science. The form falls within a group containing only four species namely *M. circinans* Earle, *M. cyperi* Pat., *M. pennata* v. Höhn and *M. pectinata* v. Höhn. The spore size alone of our species distinguishes it from all of these but *M. pennata*, while the mycelial setae serve to distinguish it from that species. Fifteen species on eleven hosts are recorded elsewhere on Rutaceae; all of these, however, lack perithecial setae.

The collections show the fungus to be generally distributed throughout the Territory of Hawaii and to occur on many species of Pelea. The fact that some collections are strictly epiphyllous, others strictly hypophyllous, and still others amphigenous, and that some collections show a colony with much crowded mycelium, while others possess a loose mycelial colony, may indicate that the species is being differentiated into varieties. Some of the most salient differences between this species and the preceding are brought out in the key, others are seen in comparing the specimens.

No. 45. **Meliola sandwicensis** El. and Ev. Bull. Torr. Bot. Cl., vol. 22, p. 434, 1895.

Group number 3112.3222.

On *Gouldia macrocarpa.* Oahu: Tantalus, June 22, no. 626; Kauai: Pipe trail, Waimea canyon, June 15, no. 459.

On *Gouldia coriacea.* Kauai: Kalalau trail, June 16, no. 482 and no. 537; Pipe trail, Waimea canyon, June 15, nos. 446 and 454.

On *Gouldia lanceolata.* Oahu: Tantalus, June 22, no. 612; Kuliouou, May 29, no. 144.

On *Gouldia terminalis.* Hawaii: Waimea, July 30, no. 1050. Oahu: Tantalus, June 22, nos. 604 and 621.

On *Gouldia elongata.* Kauai: Kalalau trail, June 16, no. 537.

On *Gouldia sps.* Oahu: Olympus, June 24, nos. 709 and 720. Hawaii: Hamakua, Upper ditch trail, July 28, no. 1028; July 31, nos. 1060, 1078, and 1085. Kauai: Kalalau trail, June 16, no. 495; Pipe trail, Waimea canyon, June 15, nos. 432 and 1162.

On *Kadua knudsenii.* Kauai: Kalalau trail, June 16, no. 525.

On *Kadua sp.* Oahu: Tantalus, June 22, nos. 601 and 597; Olympus, June 24, no. 708. Hawaii: Waimea, July 30, no. 1049. Maui: Mapulehu Valley, July, 1912, Forbes-Stevens, no. 311.

This fungus was originally described as on a rubiaceous host by Ellis and Everhart from Heller's specimen no. 2369. It appears, as the above collections show, to be widespread and common on Gouldia and Kadua.

No. 46. **Meliola koae** Stevens n. sp.

Fungus amphigenous on leaves and on both sides of the phyllodia. Colonies 2-6 mm. in diameter, black, more or less dense, setae numerous. Perithecia abundant in the central regions of large colonies, globose, 170-260 μ in diameter; surface with small prominences. Perithecial appendages none. Asci evanescent. Spores 4-septate, 47-50 by 12-14 μ, obtuse, constricted at the septa. Mycelium crooked, branching irregularly. Capitate hyphopodia numerous, opposite or alternate, mostly opposite; stalk cell short, head cell nearly oblong, straight or bent. Ampulliform hyphopodia few. Mycelial setae numerous, 170-250 μ long, simple, crooked to scythe-shaped, black, 7 μ thick at base, apex obtuse, pale.

Group number 3112.4231. (See Pl. II *K;* fig. 7, *h.*)

On *Acacia koa.* Oahu: Wahiawa, May 31, no. 163 (type); Kauai: Kalalau trail, May 31, no. 521; Hawaii: by Lyon, October, 1913, Lyon no. 415.

Although numerous species of Meliola have been described on Leguminosae, none of these agrees with our species.

No. 47. **Meliola peleae** Stevens n. sp.

Fungus amphigenous, usually more abundant below, but sometimes exclusively above. Colonies usually 6-10 mm. in diameter, often confluent, dense, setae abundant. Perithecia, globose, 140-215 μ in diameter. Perithecial appendages none. Surface of perithecium rough with low tubercles. Asci evanescent. Spores 4-septate, 43 by 15 μ, obtuse, constricted at the septa. Mycelium dense, branching at acute angles, 7 μ thick. Capitate hyphopodia numerous, opposite; stalk cell short, head cell nearly

oblong, regular. Ampulliform hyphopodia rare, opposite or alternate. Mycelial setae 500-600 μ long, straight, black, apex obtuse, sometimes quite sparse.

Group number 3112.4233. (See Pl. II, *G;* fig. 7, *g.*)

On *Pelea sp.* Oahu: Olympus, June 24, nos. 669 and 726; Kauai: Waimea canyon, June 15, no. 434; Hawaii: Hamakua upper ditch trail, July 31, no. 1073; Kona, Keauhou, July 25, no. 988; Kilauea, July 14, no. 840 (type); Molokai: Pukoo Ridge, August, 1912, Forbes-Stevens, no. 411.

On *Pelea rotundifolia.* Oahu: Wahiawa, June 30, no. 200.

On *Pelea barbigera.* Kauai: Waimea canyon, June 15, no. 440.

On *Pelea elliptica.* Oahu: Wahiawa, June 3, no. 203; Lanai: Munro in 1915 and 1916.

On *Pelea sandwicensis.* Kauai: Waimea canyon, June 15, no. 449.

On *Pelea cinerea.* Lanai: in 1913, Forbes-Stevens, no. 251; Oahu: in 1912, no. 1776, and Forbes-Stevens, no. 1328.

On *Cryptocarya mannii.* Kauai: Kalalau trail, June 16, no. 506.

This species appears to be more closely related to *M. ludibunda* than to other described species, but it differs from this in several characters. It agrees with none of the species described on the Rutaceae.

Though this and *M. juddiana* both occur on Pelea, sometimes found even upon the same leaf (Forbes-Stevens no. 1328). The distinguishing characters are marked, particularly in that one has a setose perithecium and the other no such setae; one has opposite hypopodia and the other alternate. There are differences in the character of the mycelium. The two species do not intergrade. One specimen, no. 1073, was without setae and was of dense mycelium; but this was apparently due to heavy overgrowth by a parasite. The distribution of these two fungi on many species of Pelea and on many of the islands is noteworthy.

No. 48. **Meliola sideroxyli** Stevens n. sp.

Fungus amphigenous more abundant above. Colonies 1-3 mm. in diameter, irregular, indefinite, and scattered, numerous, with few setae. Perithecia globose, small, 90 μ in diameter. Surface slightly rough. Perithecial appendages none. Asci evanescent. Spores 4-septate, 40 by 18 μ, obtuse, constricted at the septa. Mycelium loose, straight or crooked, branching at acute angles. Capitate hyphopodia numerous, alternate or opposite; stalk cell short, head cell oblong. Ampulliform hyphopodia numerous, opposite, alternate or irregular, occurring in groups or scattered. Mycelial setae few, 460-600 μ long, simple, straight or somewhat crooked, black to straw color, 9 μ thick at base, apex obtuse, pale, translucent. (See fig. 8, *a.*)

Group number 3113.3213.

On *Sideroxylon sandwicense.* Kauai: Kokee, August 28, no. 1160, O. H. Swezey.

Four species of Meliola, all of the formula 3111, have been described on the Sapotaceae. The present form is nearest to *M. callicarpae* from which it differs in both perithecia and setae.

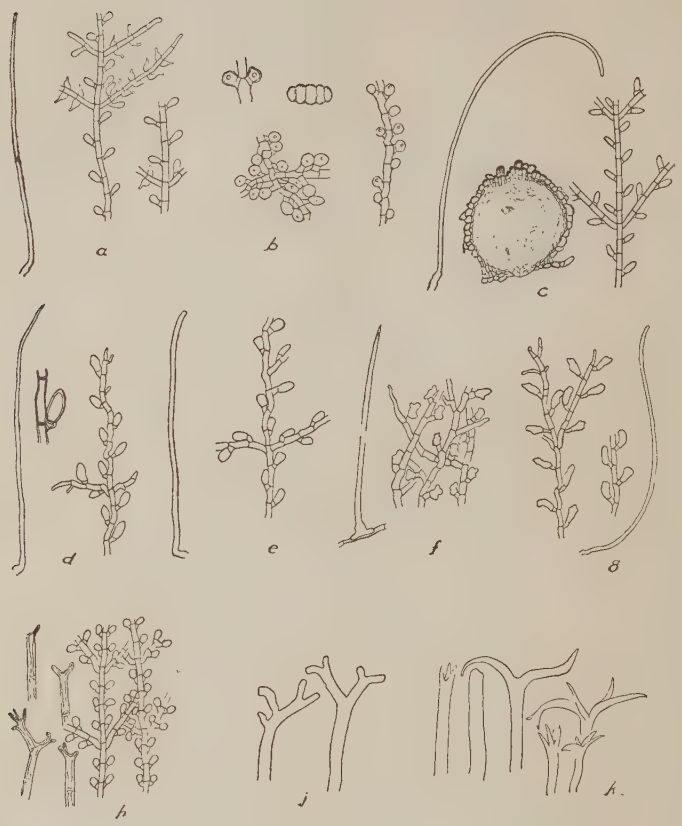


FIGURE 8.—Meliola: *a, Meliola sideroxyli* (No. 1160) on *Sideroxylon sandwicensis,* showing mycelium and setae; *b, M. lyoni* (No. 901) on *Dodonaea viscosa* —crowded mycelium with capitate hyphopodia and also a spore; *c, M. hawaiiensis* No. 667 on *Eugenia sandwicensis*—mycelium and a setum, also section of a perithecium, showing its thin wall; *d, M. morbosa* (No. 452) on *Claoxylon sandwicense*—mycelium, capitate hyphopodia, and a setum; *e, M. visci* (No. 1149) on *Viscum articulatum*—mycelium and a setum; *f, M. gregoriana* (No. 2306) on *Danella odorata*—portion of colony, showing crowded mycelium with large angular, capitate hyphopodia and a setum; *g, M. osmanthi* (No. 513) on *Osmanthus sandwicensis*— mycelium and a setum; *h, M. kauaiensis* (No. 436) on *Kadua knudsenii*— mycelium and setal tips; *j, M. dracaenae* (No. 1393) on *Dracaena aurea*— tips of setae; *k, M. palmicola* (No. 678) on palm—tips of setae.

No. 49. **Meliola lyoni** Stevens n. sp.

Fungus amphigenous. Colonies very small, 1-2 mm. in diameter, scattered, numerous, dense, partially crustose. Perithecia abundant in the central regions of old colonies, globose, 150-215 μ in diameter. Surface smooth. Perithecial appendages none. Asci evanescent, 2-3-4 spored. Spores 4-septate, 43-47 by 18-20 μ, obtuse, constricted at the septa. Mycelium dense, crooked, in older portions matted and crustose, quite thick (7.5 μ). Capitate hyphopodia numerous, opposite or alternate; stalk cell short, head cell nearly globular, about 14 μ in diameter, regular, with prominent penetration pore. Ampulliform hyphopodia numerous, usually opposite, occurring in groups. Mycelial setae few, usually only 2-10 per colony, often absent, long (340 μ), simple, straight or slightly crooked, apex obtuse. (See fig. 8, *b*.)

Group number 3113.4232.

On *Dodonaea viscosa*. Hawaii: Kilauea, July 14, no. 843 (type), and July 16, no. 865; Hualalai, July 19, no. 901, by Chas. Judd; flow of 1855 below Hale Aloha, June 7, 1915, Forbes-Stevens, no. 754; Kauai: Kalalau trail, June 16, no. 508; also Forbes-Stevens, no. 87.

This fungus falls near *M. abrupta* Syd. and its close kin, but agrees with none of these completely. One species, *M. cookeana* var. *major* Gaill., described on Dodonaea from Brazil does not agree closely with our species. The most distinctive features of the fungus are its small, often crustose, colonies and the globular head cells of the capitate hyphopodia.

Named in honor of Dr. H. L. Lyon of Honolulu in recognition of his work on Hawaiian fungi.

No. 50. **Meliola hawaiiensis** Stevens n. sp.

Fungus amphigenous, more abundant above. Epiphyllous colonies 2-4 mm. in diameter, scattered, with numerous setae. Hypophyllous colonies smaller. Perithecia abundant, globose, 170-200 μ in diameter. Surface rough. Perithecial appendages none. Asci evanescent, 2-spored. Spores oblong, 4-septate, 50 by 14 μ, obtuse, constricted at the septa. Mycelium dense, almost crustose, branching at acute angles. Capitate hyphopodia numerous, alternate; stalk cell short, head cell nearly oblong. Ampulliform hyphopodia rare. Mycelial setae long, 185-310 μ, simple, curved or sickle-shaped, black, 9 μ, thick at base, apex obtuse.

Group number 3111.4221. (See fig. 8, *c*.)

On *Eugenia sandwicensis*. Oahu: Olympus, June 24, no. 667 (type). Kauai: Kalalau trail, June 16, no. 490. Maui: Kaluaaha, Aug., 1912, Forbes-Stevens, no. 315; collected also by Lyon in 1913 (Lyon no. 275); also in the Lyon collection as no. 60, which was reported by Atkinson as immature and possibly as *Asterina crustosa*.

The fungus grows as dense, black, epiphyllous colonies. Beneath these is produced a distinct diseased spot of slightly larger area than that of the colony. On the lower side of the leaf these spots show plainly as definitely limited, brown regions in the normal green. Microtome sections through the diseased spots showed the protoplasts and chloroplasts disorganized, though it did not show the presence of any mycelium. Chemical alteration

was evident from the fact that the diseased region accepted stains more readily, also that the diseased epidermis was softer and tore apart much more readily than did the normal epidermis. Such extensive pathogenic changes as are here shown are seldom produced by any Meliola and in the absence of any mycelial invasion must indicate powerful toxic or enzymic action. This species differs markedly from the six described on Eugenia, also from *M. densa, M. psidii,* and *M. laxa,* the only forms at all closely related, among the many species recorded on Myrtaceae. Among species on other hosts those nearest to it are *M. falciseta* and *M. didymopanicis,* but it is clearly distinct from these.

No. 51. **Meliola morbosa** Stevens n. sp.

Fungus amphigenous. Colonies 1-3 mm. in diameter, scattered, with few setae. Perithecia abundant, globose, 110-190 μ in diameter; surface smooth or slightly rough with conic protuberances. Perithecial appendages none. Asci evanescent, 2-spored. Spores 4-septate, 36 by 14 μ, obtuse, constricted at the septa. Mycelium slightly crooked, branching at acute angles. Capitate hyphopodia numerous, alternate; stalk cell short, head cell oblong, large (15-30 μ long.) Ampulliform hyphopodia rare, scattered. Mycelial setae few, about 200-250 μ long, simple, straight, or somewhat curved, stiff, black, 11 μ thick at base, apex abruptly acute. (See fig. 8, *d.*)

Group number 3111.4221.

On *Claoxylon sandwicense.* Kauai: Upper Waimea canyon, June 15, no. 452.

Very definite diseased spots somewhat larger than the colonies are produced.

No. 52. **Meliola visci** Stevens n. sp.

Colonies diffuse, often a centimeter in diameter, densely black, with numerous setae. Perithecia very numerous, globose, 110-215 μ in diameter. Surface slightly rough with low prominences. Perithecial appendages none. Asci evanescent. Spores 4-septate, 43-46 by 18 μ, obtuse, constricted at the septa. Mycelium very black, dense and crooked, often matted, branching irregularly. Capitate hyphopodia numerous, alternate; stalk cell short, head cell oblong or somewhat irregular. Ampulliform hyphopodia few, opposite or alternate. Mycelial setae, 150-230 μ long, simple, straight or somewhat crooked, black, 9 μ thick at base, apex obtuse. (See fig. 8, *e.*)

Group number 3111.4231.

On *Viscum articulatum.* Oahu: Wahiawa, May 31, no. 167 (type); Maui: Olinda Pipeline, Sept. 5, no. 1149.

This fungus was found on Viscum which was growing on koa infested with *M. koae,* and since to the unaided eye the colonies on koa and Viscum looked much alike, it appeared that the meliolas might be the same. Microscopic examination, however, shows them to be different, particularly as to the arrangement and form of the capitate hyphopodia.

Two species have been described on the Loranthaceae, one on Loranthus with forked setae, the other on Viscum (*M. arcuata* Doidge) with larger spores than the present form.

No. 53. **Meliola gregoriana** Stevens n. sp.

Fungus amphigenous, more abundant above. Colonies 2-5 mm. in diameter, scattered, numerous, with numerous setae. Perithecia rare, globose, about 200 μ in diameter. Surface smooth. Perithecial appendages none. Asci evanescent. Spores 4-septate, 47 by 18 μ, obtuse, slightly constricted at the septa. Mycelium varying from somewhat loose to closely matted, branching at acute angles, but often paralleling the veins. Capitate hyphopodia numerous, alternate; stalk cell short to long (15 μ), head cell pyriform to angular and irregular. Ampulliform hyphopodia numerous, opposite or alternate, often occurring in groups. Mycelial setae 620 μ long, simple, straight, black, apex acute, absent on old weathered colonies. (See fig. 8, *f*.)

Group number 3111.4223.

On *Dianella odorata*. Oahu: Kalihi valley, March, 1916; Forbes-Stevens, no. 2306.

Named in honor of Herbert E. Gregory, Director of the Bishop Museum.

Meliola gregoriana differs clearly from *M. dracaenae* in length and shape of setae and in size of spores, from *M. lucumae* in setae and hyphopodia, from *M. rourcae* in mycelium. All previously described on Liliaceae are with dentate apices to the mycelial setae.

No. 54. **Meliola osmanthi** Sydow, emend. Stevens

Sydow, Ann. Myc. vol. 18, p. 157, 1918

Fungus amphigenous, more abundant below. Colonies 2-8 mm. in diameter, circular or irregular, black, often blending to cover the leaf. Hypophyllous colonies with more abundant setae. Perithecia abundant, globose, 185 μ in diameter. Surface smooth. Perithecial appendages none. Asci evanescent. Spores 4-septate, 40-43 by 18-21 μ, obtuse, slightly constricted at the septa. Mycelium crooked, often very dense, branching irregularly; capitate hyphopodia numerous, alternate; stalk cell short, head cell rarely oblong, more often angular or irregular. Ampulliform hyphopodia numerous, often opposite and occurring in groups. Mycelial setae, often very numerous, 220-280 μ, simple, straight or crooked, black, 9 μ thick at base, apex obtuse. (See fig. 8, *g*.)

Group number 3111.4223.

On *Osmanthus sandwicensis*. Oahu: Kuliouou, May 29, no. 146; Ahren's ditch trail, Wahiawa, June 8, no. 289; Kauai: Kalalau trail, June 16, no. 513 (type).

Six species are described on Oleaceae, none of which agrees with this. Of species on other families, it is closest to *M. lacumae* Stev., but from this differs markedly in colony character.

No. 55. **Meliola kauaiensis** Stevens n. sp.

Fungus amphigenous. Setae abundant. Perithecia abundant in the central region of old colonies, globose, 200 μ in diameter. Surface slightly rough. Perithecial appendages none. Asci evanescent. Spores 4-septate, 43-47 by 18-20 μ obtuse, constricted at the septa. Mycelium dense, branching at acute angles. Capitate hyphopodia numerous, opposite; stalk cell short, head cell nearly oblong. Ampulliform hyphopodia rare, usually opposite. Mycelial setae, 260-280 μ long,

simple, straight, black, 9 μ, thick at base, apex two to several forked, branches, 7-30 μ long. (See fig. 8, *h*.)

Group number 3132.4221.

On *Kadua knudsenii*. Kauai: Pipe trail, Waimea canyon, June 15, nos. 436 and 437.

On *Kadua sp*. Kauai: Kalalau trail, June 16, no. 531 (type).

No species on Rubiaceae even approaches this in specific characters. Its nearest kin among other meliolas appears to be *M. hessii* and *M. crucifera*, from which, however, it differs distinctly.

No. 56. **Meliola dracaenae** Stevens n. sp.

Fungus amphigenous. Colonies 1-4 mm. in diameter, somewhat elongated lengthwise of the leaf, black, scattered, with numerous setae. Perithecia abundant in the central regions of large colonies, globose, very variable in size, 185-230μ in diameter. Surface very slightly roughened. Perithecial appendages none. Asci evanescent. Spores 4-septate, quite variable in size, 54-61 by 18-25 μ, obtuse, constricted at the septa. Mycelium very dense, usually crustose, crooked, branching at acute angles. Capitate hyphopodia numerous, alternate unilateral or irregularly arranged; stalk cell short, head cell pyriform or slightly irregular. Ampulliform hyphopodia scattered or clustered. Mycelial setae about 300 μ, long, scythe-shaped, 9 μ thick at base, apex toothed or with short and very irregular branches, or often simple. (See fig. 8, *j*.)

Group number 3131.5321.

On *Dracaena aurea*. Kauai: Pipe trail, upper Waimea canyon, June 15, no. 419 (type); Forbes-Stevens, no. 1393, 1909.

Three species of Meliola have been described on the Liliaceae, all with divided apexes of the setae, but differing clearly from this form.

No. 57. **Meliola palmicola** Wint. Hedwigia, vol 26, p. 61, 1887.

Group number 3131.4223.

On palm, Forbes-Stevens, no. 678.

Three species of Meliola of the formula 3131 have been described on palms and two others of formulae 3111, and 311—. The present specimen is closely related to both *M. furcata* and *M. palmicola*, and appears to agree more closely with *M. palmicola*. This species appears to be widely distributed, being first described from Tonkin and later reported from America, India, and South Africa. (See fig. 8, *k*.)

No. 58. **Meliola sp. ind.**

On *Maba sandwicensis*. Oahu: Kuliouou, May 29, no. 145, collected by Caum.

The mycelium was dense, branching at acute angles. Capitate hyphopodia numerous, crowded, alternate; stalk cell short, head cell oblong, regular. Mycelial setae 600 μ long, simple, straight or crooked, black. Further details could not be determined.

On *Suttonia sp.* Oahu: Kuliouou, June 29, no. 143, collected by Caum.

Mycelium branching at acute angles. Capitate hyphopodia numerous, opposite; stalk cell short, head cell oblong to pyriform. Mycelial setae 220 μ long, simple, straight or crooked, black, 7 μ thick at base, apex acute.

29. IRENE Theis. and Syd. Ann. Myc., vol. 15, p. 194, 1917

KEY TO HAWAIIAN SPECIES OF THE GENUS IRENE

Spores 3-septate.
- Perithecia with low conic prominences 59, **I. exilis** 2105.5230
- Perithecia with conic prominences more than 12 μ thick and usually less than 20 μ long 60, **I. splendens** 2201.5330
- Perithecia with several conic protuberances more than 20 μ long 61, **I. puiggarii** 2201.4220

Spores 4-septate:
- Perithecium smooth to warty (warts not predominant or well differentiated)
 - Mycelium not sinuous: 62, **I. triloba** 3201.4220
 - Mycelium sinuous:
 - Spores curved: 63, **I. cheirodendronis** 3101.6240
 - Spores not curved: 64, **I. cyrtandrae** 3101.4220
- Perithecia with tubercles well differentiated 65, **I. inermis** 3201.3230
- Perithecium with setae more than 60 μ long 66, **I. scaevolicola** 3402.4230

No. 59. **Irene exilis** (Syd.) Stevens n. comb.

Meliola exilis Syd. Ann. Myc., vol. 2, 170, 1904

Group number 2102.5230.

On *Vaccinium reticulatum.* Hawaii: Kilauea, July 13, no. 821.

Five species only of Meliola are described on the Ericaceae, one on each of five genera. The present form agrees closely with Sydow's description of *M. exilis.* It is noteworthy that all the species described on the Ericaceae have 3-septate spores. This species though found on the same collection, no. 821, with *Meliola vaccinii,* indeed on the same leaf, is very distinct in many respects. (See fig. 9, *a.*)

No. 60. **Irene splendens** Stevens n. sp.

Fungus hypophyllous. Colonies 1-6 mm. in diameter, circular to irregular, scattered, sparse or numerous. Perithecia abundant in each colony, globose, 250-300 μ in diameter. Surface very rough with many conic protuberances about 15 μ high, but occasionally longer (50 μ) and vermiform, 25 μ broad at base. Asci evanescent, 2-spored. Spores 3-septate, 47-55 by 21-22 μ, obtuse, strongly constricted at the central septum, less so at the others, dark, wall brittle. Mycelium scattered, crooked, branching irregularly. Capitate hyphopodia few, alternate; stalk cell long, head cell irregularly angular. Ampulliform hyphopodia not seen. Mycelial setae none. (See fig. 9, *b.*)

Group number 2201.5330.

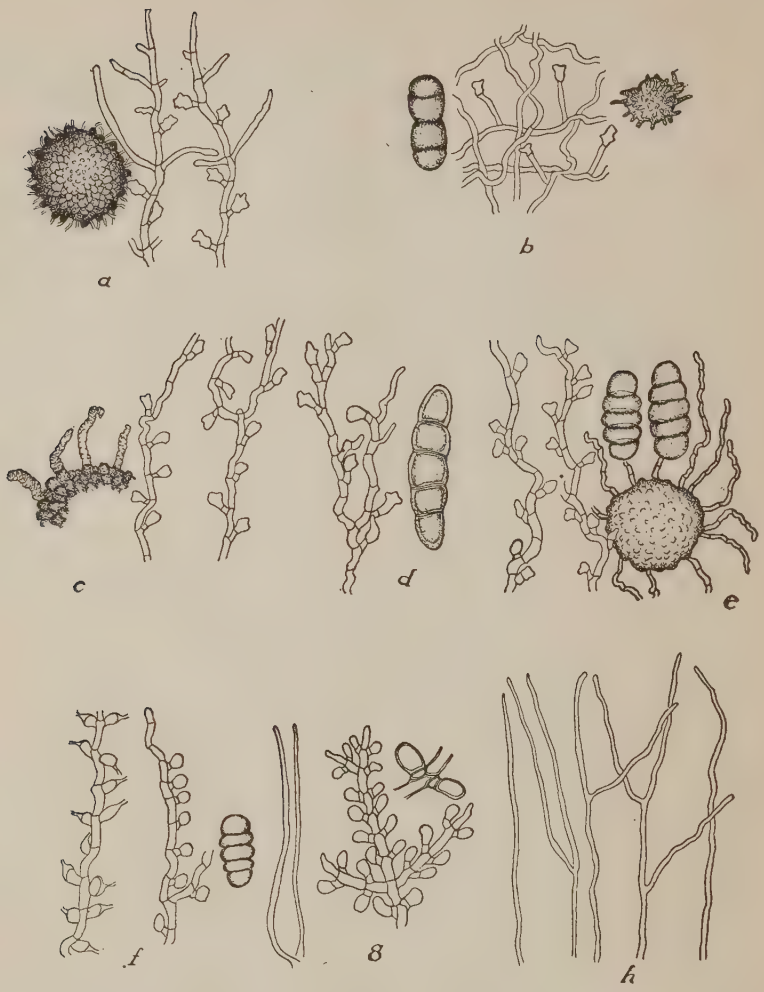


FIGURE 9.—Meliolineae: *a-g*, Irene: *a, I. exilis* (No. 821) on *Vaccinium reticulatum*—mycelium with capitate hyphopodia and a perithecium showing surface roughening; *b, I. splendens* (No. 430) on *Alphitonia excelsa*—mycelium and a perithecium showing surface prominences, also a spore; *c, I. puiggarii* (No. 1029) on *Rubus hawaiiensis*—mycelium with hyphopodia and a portion of a perithecium showing appendages; *d, I. cheirodendronis* (No. 1165) on *Cheirodendron gaudichaudii*—mycelium with hyphopodia, also a spore; *e, I. cyrtandrae* (No. 793) on *Cyrtandra cordifolia*—mycelium, spores and a perithecium with setae-like mycelium; *f, I. inermis* (Heller No. 2062) on *Physalis peruviana*—mycelium with hyphopodia, also a spore; *g, I. scaevolicola* (No. 160) on *Scaevola chamissoniana*—mycelium, hyphopodia, and perithecial appendages; *h, Meliolina haplochaeta* (Lyon no. 1) on *Metrosideros collina polymorpha var.*, showing setae, some simple, some branched.

On *Alphitonia excelsa.* Kauai: Upper Waimea canyon, June 15, no. 430.

This exceedingly interesting form is in a group consisting heretofore of only three known species, *M. natalensis* in South Africa, which has smaller spores, *M. ilicis,* so imperfectly described as to be unrecognizable, and *M. puiggarii* (see next number) from which it differs markedly in spore shape and character of mycelium. The perithecia and asci are typically those of Meliola, but the spore, with its deep median constriction, and the mycelium with few hyphopodia, show kinship with genera such as Perisporium. *M. acervata* has been erroneously reported as on *Alphitonia ponderosa* in the Heller specimen in the Shaw gardens, but the specimen is clearly *Physalis peruviana.*

No. 61. **Irene puiggarii** (Speg.) Doidge, S. Africa Jour. Nat. Hist., vol. 2, p. 39, 1920.

Meliola puiggarii (Speg.) Fung. Puigg. n. 228.

Group number 2201.4220.

On *Rubus hawaiiensis.* Hawaii: Hamakua, Upper ditch trail, July 28, no. 1029. Maui: Pogue's ditch trail, Sept. 6, nos. 1155 and 1159; Olinda pipeline, Sept. 5, no. 1138.

Of all meliolas *M. puggarii* is one of the most clearly marked in specific characters. (See fig. 9, *c.*) Forms with three septa and those with larviform perithecial appendages are comparatively rare; forms combining these two characters number only five known species in the world, three from Africa and two from South America. The secondary characters afforded by the capitate hyphopodia are also quite distinctive. Considering all characters, this is readily separated from all other species. Comparison of the type specimen collected at Apiahay in Brazil in 1888 (kindly loaned to me by Prof. Spegazzini) with my Hawaiian and Porto Rican specimens (Nos. 8270, 8892, 8650) and with three specimens collected by Miss Doidge in South Africa (Nos. 1574, 177 and an unnumbered specimen) show all of these specimens, of such distant origin, to be remarkably alike, indeed indistinguishable. In spite of the occurrence of this form on lands so far apart as Africa, Hawaii, Brazil, and Porto Rico, I believe them all to belong to one species. It is difficult to believe that this unique combination of rare characters has arisen independently several times, and is more reasonable to assume that in some manner the species has been distributed from its place of origin. Owing to the inconspicuous character of the colonies this fungus often escapes observation, unless the hand lens be used; it may well be that it is of more general distribution and grows on more hosts than the collections indicate.

No. 62. **Irene triloba** (Wint.) Stevens n. comb.

Meliola triloba (Wint.) Hedwigia, vol. 25, p. 95, 1886

Group number 3201.4220.

On *Pipturus albidus.* Oahu: Olympus, June 24, no. 713; Tantalus, June 22, nos. 608, 661. Hawaii: Wailuku river, July 8, no. 752; between Kona and Waimea, July 27, no. 1020; Puna, July 9, no. 760; between Hilo and Kilauea, July 10, no. 766; Keauhou, Kona, Bishop Estate road, July 25, no. 982.

These collections are referred provisionally to this species on a basis of comparison with printed descriptions and with specimens on Pilea previously so determined by me and by others.

No. 63. **Irene cheirodendronis** Stevens n. sp.

Fungus hypophyllous. Colonies black, punctiform, circular, 1-2 mm. in diameter, scattered. Perithecia, one, rarely more, in the centers of colonies. At first dimidiate, later globose, 280-420 μ in diameter, smooth or slightly rough. No appendages. Asci evanescent, 2-spored. Spores 4-septate, 54-61 by 14-18 μ, obtuse, thickest at the middle and tapering toward each end, very slightly constricted at the septa, slightly curved. Mycelium dense, coarse, almost crustose, very crooked, branching at acute angles and irregularly. Capitate hyphopodia few, scattered, alternate; stalk cell short, head cell very angular and irregular. Ampulliform hyphopodia not seen. No setae. (See fig. 9, *d.*)

Group number 3101.5240.

On *Cheirodendron gaudichaudii.* Oahu: Tantalus, June 22, no. 641; Kauai: Alakai swamp, August 22, no. 1165 (type), O. H. Swezey.

No non-setose form has been described on the Araliaceae. The shape of the spore is characteristic.

No. 64. **Irene cyrtandrae** Stevens n. sp.

Fungus amphigenous. Colonies 1-2 mm. in diameter, scattered, numerous. Perithecia few in the central regions of large colonies, globose, 150-170 μ in diameter. Surface slightly rough. Perithecial appendages none. Asci evanescent. Spores 4-septate, 40-43 by 18 μ, obtuse, constricted at the septa. Mycelium sinuous, usually bent abruptly at each hyphopodium, branching irregular. Capitate hyphopodia numerous, alternate; stalk cell short, head cell oval to pyriform or irregular and angular. Ampulliform hyphopodia opposite or alternate, often occurring in groups. Mycelial setae none. (See fig. 9, *e.*)

Group number 3101.4220.

On *Cyrtandra lessoniana,* Kauai: Kalalau trail, June 16, no. 481 (type).

On *Cyrtandra cordifolia,* Hawaii: Kilauea, July 11, no. 793.

This species is remarkable in that the mycelium, though usually with abundant hyphopodia, is occasionally found reaching out for long distances and devoid, or nearly devoid, of hyphopodia. Such filaments, often found in the central regions of a colony, resemble setae of peculiar type and might be mistaken for such. The characters of the mycelium and hyphopo-

dia are also distinctive. Only one other meliola has been reported on the Gesneriaceae, and that a setose one.

No. 65. **Irene inermis** (Kalch. and Cooke) Theiss. and Syd. Ann Myc., vol. 15, p. 194, 1917

Meliola inermis (Kalch. and Cooke) Grevillea, vol. 9, p. 34, 1880
Meliola acervata El. and Ev. Bull Torr. Bot. Cl., vol. 24, p. 126, 1897
Group number 3201.3230.

On *Physalis peruviana*. Hawaii: Keauhou, Kona, Bishop Estate road, July 21, no. 915; Kauai: Pipe trail, Waimea canyon, June 15, nos. 462 and 463; Oahu: Nuuanu valley, Sept. 14, no. 1164; collected also by Lyon, Tantalus, May 11, 1913, Lyon no.; and Lyon nos. 332 and 418. Also reported from Hawaii on *Physalis peruviana* in the Heller collection, and described by Ellis and Everhart as *M. acervata*.

My fungus agrees more closely with the original description than with the description given by Ellis and Everhart. Though usually epiphyllous, it is also frequently found hypophyllous. The perithecia are very rough with many conic, translucent protuberances, usually about 30 μ high, but sometimes 45 μ. They also frequently exceed 200 μ in diameter. The mycelium is very characteristically crooked, usually with a sharp bend, geniculation, at each hyphopodium. The head cells of the hyphopodia are nearly globular. (See fig. 9, *f*.)

No. 66. **Irene scaevolicola** Stevens n. sp.

Fungus amphigenous, colonies more abundant below. Epiphyllous colonies 1-3 mm. in diameter, scattered. Hypophyllous colonies 1-2 mm. in diameter. Perithecia, globose 190-260 μ in diameter. Surface somewhat rough. Perithecial appendages consist of long, straight or crooked, translucent setae, which arise, several in number, around the base of the perithecium; obtuse, 300-380 μ long. Spores 4-septate, 40-46 by 19 μ, obtuse, constricted at the septa. Mycelium dense, branching at acute angles. Capitate hyphopodia numerous, crowded, opposite; stalk cell short, head cell oblong or rarely globular. Ampulliform hyphopodia scattered. Mycelial setae none. (See fig. 9, *g*.)
Group number 3402.4230.

On *Scaevola chamissoniana*. Oahu: Wahiawa, May 31, nos. 160 (type); June 3, nos. 229, 234, and 243; Tantalus, June 22, no. 616; Olympus, June 24, no. 698; Hawaii: between Hilo and Kilauea, July 10, no. 774; Kauai: Kalalau trail, June 16, nos. 492, 497, 486, 502, and 510.

On *Scaevola glabra*. Kauai: Kalalau trail, June 16, no. 472; Hawaii: between Hilo and Kilauea, July 10, no. 778.

On *Scaevola mollis*. Oahu: Olympus, June 24, nos. 663, 696 and 703; Palolo Valley, June 10, no. 331, June 3, no. 251.

Only two known species show a group number 3402, both of these described in my laboratory and both differing essentially from the present species. The only species that has been described on the Goodeniaceae—namely, *M. scaevolae* Syd. on *Scaevola fructescentis* in the Philippines, is

also quite different. The extremely hairy lower surface of the leaves of *S. mollis* do not appear to change at all the character of the Irene growth upon them.

30. MELIOLINA Syd. Ann. Myc., vol. 12, p. 553, 1914

No. 67. **Meliolina haplochaeta** Syd. Ann. Myc., vol. 15, p. 145, 1917

On *Metrosideros collina polymorpha* var.? Oahu: Nuuanu Pali, Dec. 1, 1907, Lyon no. 1 (type); Kalihi valley, June 2, no. 176. Hawaii: Kealakekua, July 23, no. 965; between Hilo and Kilauea, July 10, no. 775. Molokai: Forbes-Stevens, Waialua ridge, Sept. 1912, no. 593.

The colonies of this fungus are as described by Sydow, small and distinct. In many specimens no diseased spots are visible from the opposite side of the leaf, but in some a small diseased area is evident. Though the setae are described by Sydow as simple, examination of this more extensive material shows that some of them are branched. The specimen, Lyon no. 1, was sent to G. F. Atkinson, who sent it to Rehm, who reported it back to Atkinson under a manuscript name that was never published. Rehm later sent the specimen to Sydow in whose hands it became the type as indicated above. (See fig. 9, *h*.)

No. 68. **Meliolina sydowiana** Stevens n. sp.

Fungus hypophyllous. Colonies 3-20 mm. in diameter, circular, often concentric to irregular, indefinite, black, with setae very numerous. Perithecia abundant, globose, 300-340 μ in diameter. Surface densely setose, setae similar to those of the mycelium. Asci evanescent. Spores 3-septate, 54 by 15 μ, obtuse, tapering to each end, much constricted at the septa. Mycelium loose. True capitate hyphopodia absent, occasional short branches sometimes found. Ampulliform hyphopodia none. Mycelial setae 420 μ long, dichotomously or irregularly branched, black, about 5 μ thick at base and uniform in diameter, except at the apices of the branches which taper and are pale in color, branches often 200 μ long. Apex acute. (See fig. 10, *a*.)

On *Metrosideros macropus*. Oahu: Olympus, June 24, no. 721; Kuliouou, May 29, Caum.

On *Metrosideros collina polymorpha* var. *incana* Rock (155). Hawaii: Kilauea, July 11, 1921, no. 788.

On *Metrosideros collina polymorpha* var.? Oahu: Tantalus, June 22, no. 639. Hawaii: Kealakekua, July 25, no. 976. Maui: Olinda pipe line, Sept. 5, 1921, nos. 1144 and 1145.

Two species of this genus, and closely related to the present form, have been described on Eugenia, viz., *M. radicans*, on *E. xanthophylla* and *M. pulcherrima* on *E. jambolana*, both from the Philippines. The present species is pronounced by Sydow as distinct from these. A large distinct diseased spot is produced, showing clearly from the opposite side of the leaf. Microtome sections show the fungus penetrating the cuticle at many

places and the entire mesophyll of the leaf in a diseased area is penetrated, though but sparsely, by the mycelium.

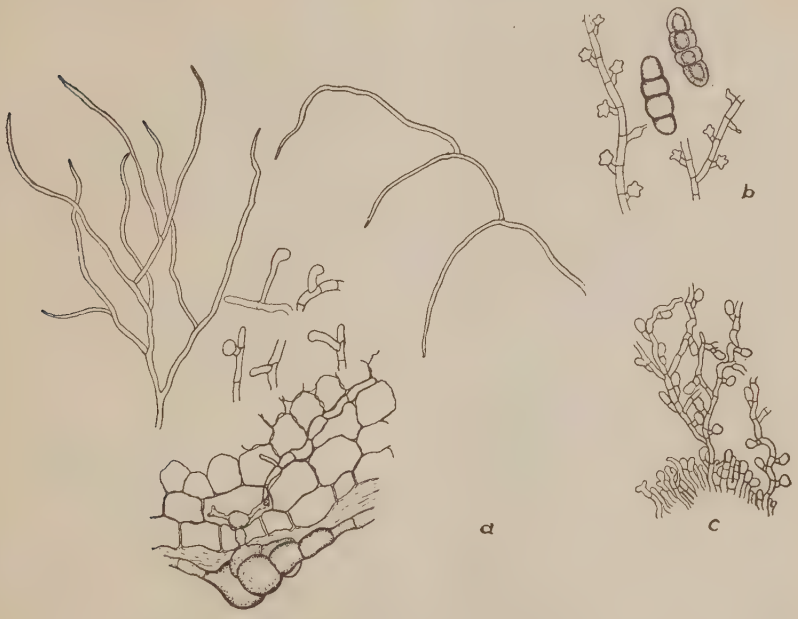


FIGURE 10.—Meliolineae: *a, Meliolina syndowiana*—setum showing branching, mycelium with vestigial haustoria, and mycelium within the host tissue; *b* and *c*, Amazonia: *b, A. perrottetiae* (No. 717*a*) on *Perrottetia sandwicensis*—mycelium with angular hyphopodia, also spores; *c, A. psychotriae* (No. 610) on Wikstroemia, showing edge of a colony with free mycelium bearing alternate hyphopodia.

31. AMAZONIA Theis. Ann. Myc., vol. 11, p. 499, 1913: vol. 15, p. 421, 1917

MELIOASTER, Doidge, Trans. Roy. Soc. S. Africa, vol. 8, p. 123, 1920

KEY TO SPECIES OF AMAZONIA

Spores 3-septate.....30 **A. perrottetiae** 2101.4220
Spores 4-septate
Colonies with solitary or few perithecia.....31 **A. psychotriae** 3101.42?0
Colonies with several perithecia.....32 **A. ohianus** 3101.42?0

No. 69. **Amazonia perrottetiae** Stevens n. sp.

Fungus epiphyllous. Colonies 3-7 mm. in diameter, scattered, numerous. Perithecia few, dimidiate, about 180 μ in diameter. Perithecial appendages none. Asci evanescent. Spores 3-septate, 43-47 by 11 μ, obtuse, only slightly constricted at the septa. Mycelium loose, slightly sinuous, branching at acute angles. Capitate hypho-

podia distant, alternate; stalk cell short to long (14 μ), head cell irregularly several lobed. Ampulliform hyphopodia alternate, scattered. Mycelial setae none. (See Pl. II, *L;* fig. 10, *b.*)

Group number 2101.4220.

On *Perrottetia sandwicensis.* Oahu: Olympus, June 24, no. 717a, (type), and no. 702; Kauai: Kalalau trail, June 16, no. 474.

The species is quite distinctive in character of mycelium, hyphophodia and spores. No species of Amazonia with 3-septate spores has been previously recorded. Seven species of Meliola have been described on the Celastraceae, of which three have 3-septate spores; none has the group number 2101. None has been described on Perrottetia.

No. 70. **Amazonia psychotriae** (P. Henn.) Theis., Ann. Myc., vol. 11, p. 499, 1913

Meliola asterinoides Wint. var. *major* Gaill Le Genre Meliola, p. 58, Paris, 1892.
Meliola asterinoides Wint. var. *psychotriae* P. Henn. Hedwigia, vol. 43, p. 361, 1904
Amazonia polypoda Syd. Ann. Myc., vol. 15, p. 145, 1917
Group number 3101.4220. (See Pl. II, *H*; fig. 10, *c.*)

On *Straussia hawaiiensis.* Oahu: Wahiawa, June 3, no. 205; Olympus, June 10, no. 337.

On *Straussia kaduana.* Oahu: Olympus, June 10, no. 335.

On *Straussia mariniana.* Kauai: Kalalau trail, June 16, no. 535. Oahu: nos. 217, 244, 252; Ahren's ditch trail, June 8, no. 276. Collected also by Lyon, no. 96, on Tantalus, Sept. 9, 1909.

On *Straussia sp.* Oahu: Tantalus, June 22, nos. 624, 617, 609; Olympus, June 24, no. 716; June 10, no. 335; and June 24, no. 715. Kauai: Kalalau trail, June 16, nos. 476, 511, 483, 496, 505, 516, and 530; Pipe trail, Waimea canyon, June 15, no. 442. Hawaii: Puna, July 9, no. 757; between Kapapala and Kona, July 20, no. 895; Keauhou, Kona, Bishop Estate road, July 23, no. 962; July 25, no. 973; Puna, July 9, no. 755.

On unknown dicotyledenous host. Kauai: Kalalau trail, June 16, no. 483.

On *Labordea sp.* Oahu: Tantalus, June 22, no. 611.

On *Scaevola sp.* Oahu: Tantalus, June 22, no. 634.

On *Scaevola glabra.* Oahu: Tantalus, June 22, no. 640.

On *Alyxia olivaeformis.* Oahu: Wahiawa, June 3, no. 239; Ahren's ditch trail, June 8, no. 985.

On *Euphorbia clusiaefolia.* Oahu: Wahiawa, June 3, nos. 202 and 212.

On *Wikstroemia elongata.* Oahu: Tantalus, June 22, no. 610.

On *Wikstroemia foetida* var. *oahuensis.* Oahu: Tantalus, June 22, no. 635.

On *Wikstroemia phillyreaefolia.* Oahu: Tantalus, June 22, no. 629.

On *Wikstroemia sp.* Maui: Halawa, August, 1912, Forbes-Stevens no. 479; Oahu: Castle trail, March, 1912, Forbes-Stevens no. 2148.

On *Clermontia multiflora.* Oahu: Olympus, June 10, nos. 330 and 329.

On *Clermontia sp.* Maui: Iao valley, Sept. 7, no. 1154.

On *Coprosma sp.* Kauai: Pipe line trail, Waimea canyon, June 15, nos. 437, 444, 458 and 456; Kalalau trail, June 16, no. 523.

On *Lobelia sp.* Hawaii: Keauhou, Bishop Estate road, July 25, no. 979.

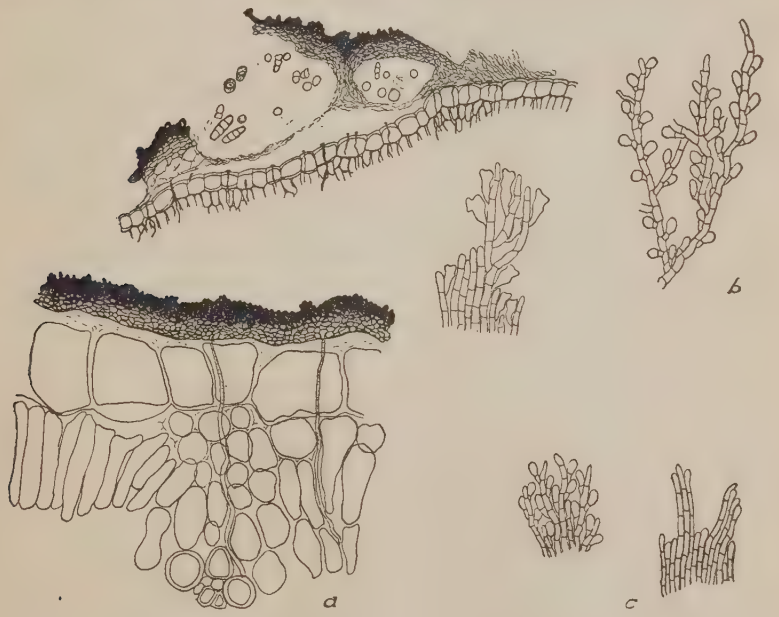


FIGURE 11.—Meliolineae: *a, Actinodothis perrottetiae* (No. 717) on *Perrottetia sandwicensis*—the mycelium at the edge, also a stroma on a leaf, showing several locules and numerous places of cuticular penetration, and the mycelium within the mesophyll; *b, Amazonia ohianus* (No. 842) on *Metrosideros polymorpha,* showing mycelium and hyphopodia; *c, Actinodothis suttoniae* (No. 143) on *Suttonia lessertiana,* showing the mycelium at the edge of a colony, a portion without hyphopodia, and another portion with atypical hyphopodia.

This form shows little or no differentiation on its many Hawaiian hosts. Some differences in hyphopodia in the series is noted, giving variation from almost globular to elliptical and oblong, also variation in the amount and character of the free mycelium, and it is possible that with sufficient study,

races or varieties might be here differentiated. The variation on a given host is, however, so great that I have referred all the collections as representing *A. psychotriae.* In some specimens the free mycelium is more abundant than in others and in some is looser, but the differences on one host appear to be as great as on different hosts. In microtome section one cavity only is usually seen. The pseudoparenchyma surrounding the cavity is many cells thick, giving the stroma a dothideaceous character. Though certain collections show the slight differences mentioned by Sydow for distinguishing his species *A. polypoda,* which is based on Lyon's no. 96, from *A. psychotriae,* these forms appear to me to intergrade with the others. All the specimens agree remarkably well in all details with the description of either *M. asterinoides* var. *major* or var. *psychotriae,* as given by Gaillard; with the figure by Arnaud (3, vol. 16), and with the specimen of Ule (*Mycotheca Braziliensis* no. 55) and with Hennings (83, vol. 43, p. 361).

Our specimen agrees well with no. 2038 labeled *M. asterinoides* Wint. kindly loaned to me from the herbarium of Brussels.

The fungus is widely distributed, being reported from the Congo region and South Africa, the Amazon region of South America, and from India. Its hosts previously reported are in the Rubiaceae.

No. 71. **Amazonia ohianus** Stevens n. sp.

Fungus epiphyllous. Colonies 2-3 mm. in diameter, scattered, sparse. Perithecia few in the central regions of old colonies, dimidiate and with an open ostiole. Perithecial appendages none. Spores 4-septate, 43-47 by 18-20 μ, obtuse, constricted at the septa. Mycelium dense, branching at acute angles. Capitate hyphopodia numerous, alternate; stalk cell short, head cell ovoid or oblong-pyriform. Ampulliform hyphopodia few, scattered. Mycelial setae none. (See fig. 11, *b.*)

Group number 3101.42?0.

On *Metrosideros polymorpha* (Ohia lehua). Hawaii: Kilauea, July 14, no. 842 (type); between Hilo and Kilauea, July 10, nos. 780 and 775; Hamakua, Upper ditch trail, July 31, no. 1065.

No Meliola of the dimidiate type is described on the Myrsineae. Indeed the flattened character of the perithecium, and the well-defined ostiole, together with the colony character and hyphopodia are distinctive.

32. ACTINODOTHIS Sydow, H. and P. Phillip, Jour. Sci., vol. 9, p. 174, 1914

The only species previously placed in this genus—namely, *A. piperis,*—is regarded by Arnaud as co-specific with *Meliola asterinoides* Wint. Whether or not this be so, I regard the characters of the Hawaiian species, particularly the possession of a stroma many cells thick bearing several locules, the absence of free mycelium, and the presence of a considerable

hypostroma within the host, as being sufficient reason for separating these forms generically from other known forms.

Since the perithecial cavities in the stroma are not enclosed in a clearly differentiated wall, the fungus might well be placed in the Dothedeales and this genus should be regarded as on the transition line between the Dothedeales and the Microthyriales.

KEY TO HAWAIIAN SPECIES OF ACTINODOTHIS

Spores 4-septate.....72, **A. suttoniae** 3100.63?0
Spores 3-septate.....73, **A. perrottetiae** 2101.42?0

No. 72. **Actinodothis suttoniae** Stevens n. sp.

Fungus amphigenous, but more abundant above than below. Colonies 1-3 mm. in diameter, scattered, densely black. Perithecia, one in the center of each colony, dimidiate with one or more loculi. Appendages none. Asci evanescent. Spores 4-septate, 65 by 20-25 μ, obtuse, constricted at the septa. Mycelium very dense, completely crustose. Capitate hyphopodia, ampulliform hyphopodia, and mycelial setae none. (See Pl. III *A, B.D.*; fig. 11, *c.*)

Group number 3100.63?0.

On *Suttonia lessertiana.* Hawaii: Hamakua, Upper ditch trail, July 31, no. 1088. Kealakekua, July 22, no. 980. Kauai: Forbes-Stevens, no. 267. Maui: Iao Valley, Sept. 7, no. 1152. Oahu: Kuliouou, May 29, no. 143 (type), collected by Caum; collected also by Rock, and by Mrs. C. S. Judd, Puu Huluhulu, July 17, 1921, no. 882.

On *Suttonia kauaiensis.* Kalalau trail, June 16, no. 47.

This fungus shows quite typical Meliola spores and mycelium, but differs essentially from the usual meliolas in that there are neither hyphopodia nor setae of any kind; but more particularly in that the plant body consists entirely of a disc composed of radiating and closely appressed mycelial threads. Since all such threads in one colony are of approximately equal length, there is no free mycelium. The condition is very much such as would be presented by *Amazonia asterinoides* deprived of its free mycelium and with several locules. The close appression of the mycelial threads may be the reason for the absence of hyphopodia. The cuticle under the mycelium was seen to be penetrated at very close intervals, at nearly every host cells length, by very fine haustoria. Their fate within the cells was not determined.

No. 73. **Actinodothis perrottetiae** Stevens n. sp.

Fungus amphigenous, but more abundant below. Colonies densely black, circular, scattered, 2-7 mm. in diameter. Perithecia several in each stroma, dimidiate or arising above the surface as true, globular perithecia. Appendages none. Asci evanescent. Spores 3-septate, 40-43 by 14 μ, obtuse, constricted at the septa. Mycelium very dense, completely crustose. Ampulliform hyphopodia and setae none. Capitate hyphopodia numerous, alternate; stalk cell short, head cell large (about 20 μ

long) very irregular and angular, or in some colonies almost or entirely absent. (See Pl. III, *C, E;* fig. 11, *a.*)

Group number 2101.42?0.

On *Perrottetia sandwicensis.* Oahu: Olympus, June 24, no. 717 (type). Kauai: Kalalau trail, June 16, no. 474. Maui: Pogue's ditch trail, Sept. 6, no. 1159. Hawaii: Waimea, July 30, no. 1055; also by Lyon no. 68.

The colonies are so thick and crustose, as to have the general aspect of a dothideaceous fungus. The brown mycelium penetrates the cuticle in many places under the thallus, and extends fully half way through the leaf, though sparse. The stroma is many cells thick and somewhat lighter in color in the interior.

CAPNODIACEAE [4]

The family Capnodiaceae includes a large, difficult, and little known group of fungi that are very abundant in the tropics and sub-tropics, very much less so in temperate regions. The term "fumagine" of the French comprises sooty, black, superficial fungi mainly belonging to this family. The nearly equivalent term in German is "Russthau" or sooty dew; in Italian the terms "morfeau," "fumago," "nero" and "mal di cenere" are used.

The sooty moulds present many difficulties of classification for diverse reasons:

(1) They are often sterile, consisting merely of mycelium; and many, if sporiferous, bear only conidia, although many have perithecia with asci and ascospores.

(2) They frequently grow in colonies which consist of more than one species of fungus, indeed it is not uncommon to have specimens that show as many as seven or more species within the limit of a low-power microscope field. In such specimens it is often difficult to distinguish which of the component parts of a colony are genetically connected and which distinct.

(3) The morphologic structures, pycnidia, setae, mycelium and even perithecia are in many instances known to be remarkably variable. How variable others are is unknown.

(4) In much of the literature, there is great uncertainty as to the taxonomic position of structures described, due to the causes above mentioned. Thus we find described by Webber as Meliola, a fungus later regarded as Capnodium by McAlpine. This confusion intensifies the taxonomic difficulties.

[4] The text regarding this family was prepared by José M. Mendoza under the guidance of F. L. Stevens and constituted part of a master's thesis submitted to the graduate school of the University of Illinois.

(5) The specimens are of such nature, usually composed of mixed colonies, that no ordinary specimen or even a given microscopic mount can serve as a type unless a very definite morphological unit on a given slide be so designated, and this is often impossible, because the perithecium —for example—must be ruptured in a water mount and the object may then be lost in making the mount permanent.

(6) The fungi are extremely difficult to isolate in pure culture, thus practically precluding this means of study.

Various classifications which differ radically from each other have been proposed for the Capnodiaceae. Three of the leading classifications are presented in the form of keys below:

SYNOPSIS OF ARNAUD'S CLASSIFICATION OF CAPNODIACEAE

A. Sphériacées dictyosporées
- a) g. Pleosphaeria Speg.
 - Sub-gen. Pleomorfea
 - " Eu-Pleosphaeria
- b) g. Teichospora Fuckel
 - Sub-gen. Eu-Teichospora
 - " Capnodium
 - " Limacinula
 - " Teichosporina
- c) g. Ceratocarpia Rolland
- d) g. Pleomeliola Sacc.
- e) g. Teichosporella Sacc.
 - Sub-gen. Tephrosticta
 - " Zukaliopsis

B. Sphériacées phragmosporées
- a) g. Limacinia Neger
 - Sub-gen. Eu-Limacinia
 - " Morfea
 - " Leptocapnodium
- b) g. Perisporium Fries
- c) g. Schenckiella Henn.
- d) g. Perisporiopsis Henn.
- e) g. Zukalia Sacc.
- f) g. Scorias Fries
- g) g. Meliola Fries
- h) g. Asteridiella MacAlp.
- i) g. Asteridium Sacc.

KEY TO THE FAMILY CAPNODIACEAE, V. HÖHNEL

A. Hyphae only subcuticular, united into a membrane.....**Kusanobotrys** P. Henn.
B. Hyphae free, superficial
- a) Spores muriform
 - 1. Asci 8-spored.....**Capnodium** Mont.
 - 2. Asci 8 to 16-spored.....**Capnodaria** Sacc.
- b) Spores 3 to several-celled
 - 1. Spores brown
 - a' Asci 8 to 16-spored.....**Capnodaria** Sacc.
 - b' Asci 8-spored
 - 1' Spores not cylindrical.....**Limacinia** Neg.
 - 2' Spores cylindrical.....**Perisporina** P. Henn.
 - 2. Spores hyaline or sub-hyaline
 - a' Hyphae sparse, not slimy.....**Perisporiopsis** P. Henn.
 - b' Hyphae abundant, bundle-like, slimy.....**Scorias** Fr.
- c) Spores 2-celled
 - 1. Mycelium in the matrix, spores brown.....**Alina** Rac.
 - 2. Mycelium wholly superficial
 - a' Asci single.....**Balladyna** Rac.
 - b' Asci numerous
 - aa. Spores hyaline.....**Dimerosporina** v. Höhn
 - bb. Spores brown.....**Henningsiomyces** Sacc.
- d) Spores 1-celled.....**Capnodiella** Sacc.

It is to be seen that in the classification of Arnaud, stress is laid on the septation of spores. Secondary and tertiary are color of spores, arrangement of mycelium and shape of perithecia, while final distinction between genera rests chiefly on the structure of perithecia.

Von Höhnel lays primary stress on the location of hyphae, and the final distinction between genera is based on the septation of spores, color of spores, and the number of spores in the ascus.

Theissen and Sydow divide Capnodiaceae into two sub-families, Eucapnodiaceae and Chaetothyrieae on the structure of perithecia; additional characters are: septation of spores, location of mycelium and perithecium and the presence or absence of setae on the perithecia. The final distinctions between genera rest chiefly on the mycelial structures, septation of spores, presence or absence of paraphyses and number of asci present.

These differences in classification tend to large differences in the grouping of the genera and even in the limiting of genera from each other. Moreover, differences in the application of rule of nomenclature lead to the employment of different generic names for the same morphological groups —for example, what is called Limacinia under one system becomes Chaetothyrium in another.

For the purpose of classification of the forms encountered in the present studies which possess a mature ascigerous stage the system of Theissen and Sydow is followed inserting in their system such additional new genera as are needed to make place for the new forms encountered, also including those new genera already described by others.

KEY TO FAMILY CAPNODIACEAE MODIFIED AFTER THAT OF THEISSEN AND SYDOW

A. Perithecia stalked, at least vertically extended..... **Eucapnodiaceae** Theiss. & Syd.
- I. Spores only transversely septate
 - 1. Spores 4 or more celled
 - a) Spores colorless
 - (1) Mycelium perisporioid, interwoven, slimy..... **Scorias**
 - (2) Mycelium dematioid, membranous..... **Antennella**
 - (3) Mycelium dematioid, setose..... **Antennellopsis**
 - b) Spores brown, ascus many-spored..... **Capnodaria**
 - 2. Spores 3-celled, hyaline..... 33. **Antennellina**
 - 3. Spores 2-celled, hyaline
 - a) Spores cylindrical, tapering at one end
 - (1) Mycelium perisporioid..... **Scoriadopsis**
 - (2) Mycelium dematioid..... **Parascorias**
 - b) Spores filiform..... **Doratospora**
- II. Spores muriform
 - 1. Spores colorless..... **Paracapnodium**
 - 2. Spores brown..... **Capnodium**

B. Perithecia not stalked, globular, dematioid **Chaetothyrieae**
I. Mycelium and perithecia superficial, free
a) Setae present
1. Spores 2-celled, colorless
a' Perithecia naked, thin-walled, clear; mycelium with long twisted setae **Dimerosporina**
b' Perithecia soft, leathery, dark; mycelium and perithecium with long rigid setae **Chaetothyrina**
c' Perithecia thin-walled, dark, with only one apical setum; mycelium setose **Ceratochaete**
2. Spores 2-celled brown
a' Mycelium with hyphopodia
1' Perithecia with single ascus **Balladyna**
2' Perithecia with many asci **Balladynopsis**
b' Mycelium without hyphopodia **Neohoehnelia**
3. Spores 4 to many-celled, colorless
a' Setae present about the ostiole only; mycelium smooth ... **Aithaloderma**
b' Setae present on mycelium or perithecium 34. **Chaetothyrium**
4. Spores many-celled, colored **Stella**
5. Spores muriform, hyaline **Treubiomyces**
6. Spores filiform **Actinocymbe**
b) Setae absent
1. Spores 2-celled, colorless
a' Paraphyses present **Microtyle**
b' Paraphyses absent **Calyptra**
2. Spores 2-celled, brown
a' Perithecia with single ascus **Balladynella**
b' Perithecia with many asci **Henningsomyces**
3. Spores 4-celled, end cells hyaline 35. **Limaciniopsis**
4. Spores transversely many-celled, colorless
a' Paraphyses present 36. **Limacinella**
b' Paraphyses absent **Limacinia**
5. Spores transversely many-celled, brown 37. **Phragmocapnias**
6. Spores muriform, hyaline to rose or colorless 38. **Phaeosaccardinula**
7. Spores muriform, dark brown **Coccodium**
II. Mycelium or perithecia immersed
a) Mycelium subcuticular, perithecia free; spores brown, 2-celled ... **Kusanobotrys**
b) Mycelium free with central foot immersed **Adelopus**

Doubtful genera
Spores 2-celled
a) Ascus 8-spored **Lizonia**
b) Ascus 16-spored **Pseudolizonia**
Spores several-celled, brown **Asteridiella**

33. ANTENNELLINA Mendoza n. gen.

Mycelium dematioid, straw-colored; perithecia globular to oval, stalked, brown to dark, ostiolate; asci ovate, aparaphysate, 8-spored; spores hyaline, cylindrical, 2-septate; pycnidia of many sizes and shapes; pycniospores hyaline, oblong.

No. 74. **Antennellina hawaiiensis** Mendoza n. sp.

Mycelium dematioid, straw-colored to pale yellow, irregularly branched; perithecia numerous, globular to oval, stalked or at least vertically extended, honey-yellow to brown, ostiolate, about 85 x 60 μ; asci ovate, numerous, aparaphysate, 8-spored, about 37 x 13 μ; spores hyaline, cylindrical, tapering toward one end, 2-septate,

about 12 x 3 μ; pycnidia numerous, honey-yellow to brown, ostiolate, of various sizes and shapes, from long-cylindrical to almost oval, about 36-84 x 16-20 μ; pycniospores numerous, hyaline, oblong, about 4 x 2 μ. (See Pl. IV, 1-4.)

On *Mangifera indica*. Oahu: Honolulu, June 14, no. 266.

The characters of this fungus resemble closely those of Antennella, Theiss. and Syd. except in the septation of spores. My fungus has 2-septate spores while those of the genus Antennella has 3-septate spores. Numerous pycnidia with pycniospores have been found in this fungus while in the description of Antennella pycnidia have not been mentioned

This fungus is associated with another, probably *Parascorias byrsonimae*. The two fungi cover the upper surface of the leaf forming two layers or strata, *Parascorias byrsonimae* being uppermost. *Antennella hawaiiensis* appears as a thin coating on the surface of the leaf, while the other has a black, thick, sooty appearance. They both cover the entire surface of the leaf and are strictly epiphyllous.

34. CHAETOTHYRIUM Speg., Fungi Guaran. vol. 2, no. 123, 1888.

No. 75. **Chaetothyrium straussiae** Mendoza n. sp.

Mycelium straw-colored, gelatinous, setose, in a mat-like weft, composed of two kinds of cells, cylindrical and ovoid; perithecia few, globular, ostiolate, setose, about 138 μ in diameter; setae numerous, long and slender, with or without hyaline coating, about 125 μ long and 7 μ wide near the base; asci numerous, ovate, 8-spored, aparaphysate, about 50 x 16 μ; spores ovate to elliptical, hyaline, 3-septate, about 21 x 8 μ. (See Pl. IV, 20-23.)

On *Straussia mariniana*. Oahu: Wahiawa, May 31, no. 157.

The characters of my fungus agree with those of the genus Chaetothyrium, but it differs from *C. rickianum* Theiss. in the size and shape of the spores which in *C. rickianum* are more nearly cylindrical and also smaller. It differs from *C. guaraniticum* Speg. and *C. musarum* (Speg.) Theiss. in spore size.

The setae are very common in this fungus. Sometimes two setae are joined together at the tips, forming into one with two basal ends. The colonies are irregular in size varying from less than a millimeter to almost covering the whole surface of the leaf and are strictly epiphyllous. The fungus is abundant in many of the specimens examined.

No. 76. **Chaetothyrium hawaiiense** Mendoza n. sp.

Mycelium hyaline to ashy, irregularly arranged, polymorphic, varying from almost beaded to cylindrical; perithecia numerous, globular, gelatinous, brown to dark, ostiolate, setose, 101-160 μ in diameter; setae from 10 to 25 in number on a perithecium, ashy to black in color, obtuse, septate, about 21 μ long and 5 μ thick near the base, absent on the mycelium; ostiole with no definite border, round; asci numerous, ovate, aparaphysate, 8-spored, about 87 x 24 μ; spores hyaline, 3-septae, about 23 x 5 μ. (See Pl. IV, 24-27.)

On *Morinda citrifolia.* Oahu: Hakipuu, on Mr. A. F. Judd's property, June 19, no. 577.

This fungus resembles Chaetothyrium Speg. sufficiently to warrant its inclusion in that genus. It differs from *C. rickianum* Theiss., because of the absence of setae on the mycelium and in the size and shape of spores. It also differs from *C. guaraniticum* Speg. in the absence of setae on the subiculum and in the shape and size of spores. *C. musarum* (Speg.) Theiss., has also 1-septate spore. Comparisons were made between this fungus and *C. peribebuyense* (Speg.) Theiss.; *C. hirsutum* (Speg.) Theiss.; *C. stuhlmannianum* (P. Henn.) Theiss.; and *C. punctiforme* Rick. and it was found that it is quite different from all of them in size and shape of spores.

The fungus described above is associated with another which apparently has numerous perithecia, but due to the absence of spores it cannot be identified. The two fungi form irregular colonies varying from less than a millimeter in diameter to almost covering the whole upper surface of the leaf. They form a leathery, sooty mass which could be picked off easily with forceps.

No. 77. **Chaetothyrium magniferae** Mendoza n. sp.

Mycelium straw-colored to pale-yellow, in appearance gelatinous, forming a weft composed of two kinds of cells, cylindrical and ovoid; perithecia numerous, amber-colored to brown, globular, ostiolate, about 120 μ in diameter, sometimes found bearing setae, sometimes without setae; setae few, from two to several on a perithecium, black, straight, acute, about 75 μ long and 6 μ thick near the base; asci numerous, ovate, 8-spored, aparaphysate, about 32 x 15 μ; spores hyaline, 5 to 6-septate, truncate at one end and round on the other, about 18 x 5 μ; pycnidia numerous, of many sizes and shapes from globular to cylindrical and long or short. (See Pl. IV, 28-33.)

On *Mangifera indica.* Oahu: Honolulu, June 6, no. 267.

This genus is based on *Chaetothyrium guaraniticum* Speg. as the type, a species that was originally described by Spegazzini as with 1-septate spores. Theissen, however, states that the mature spores are 4-celled. The present species appears to resemble Chaetothyrium sufficiently to warrant its inclusion in that genus, though my fungus differs considerably from the species already referred to. *Ch. rickianum* Theiss. is characterized by the possession of abundant setae on the subiculum with but few on the perithecia; the same is true of *Ch. guaraniticum* Speg. My fungus has no setae on subiculum. The shape of the spores and the presence of many pycnidia on this species also indicate that it is different from *C. guaraniticum* and *C. rickianum.*

The colonies are irregular, varying from less than a millimeter in diameter to almost covering the whole surface of the leaf, mostly epiphyllous, but sometimes found on the lower portion of the leaf.

35. LIMACINIOPSIS Mendoza, n. gen.

Mycelium perisporioid; perithecia globular, ostiolate, without setae; asci 8-spored, aparaphysate; spores 4-celled, brown with 2 end cells hyaline.

No. 78. **Limaciniopsis rollandiae** Mendoza n. sp.

Mycelium perisporioid, hyaline, filiform; perithecia few, globular, amber-colored to dark brown, gelatinous, ostiolate, about 96-122 μ in diameter; setae absent; asci numerous, ovate, paraphysate, 8-spored, about 67 x 21 μ; spores 4-celled, brown with two end cells hyaline, about 24 x 9 μ. (See Pl. IV, 34-37.)

On *Rollandia racemosa.* Oahu: Waiahole ditch trail, June 12, no. 407.

This fungus is closely like Limacinia except for the presence of paraphyses and the color of the end cells of the spores.

The fungus above described is associated with a filimentous blue-green alga. Colonies are more or less circular varying from about a millimeter to almost a centimeter in diameter. They are irregularly scattered and strictly epiphyllous. The alga is so closely attached to the fungus that it could be mistaken for mycelium.

36. LIMACINIELLA Mendoza, n. gen.

Mycelium nearly cylindrical, hyaline, without setae; perithecia globular, asci numerous, paraphysate, 8-spored; spores cylindrical.

No. 79. **Limaciniella psidii** Mendoza n. sp.

Mycelium composed of more or less cylindrical cells, hyaline to straw-colored, radiating from the perithecia; perithecia globular, amber to reddish-brown, with a distinct ostiole, about 200 μ in diameter; asci numerous, paraphysate, ovate, 8-spored about 68 x 14 μ; paraphyses thready; spores hyaline, long, cylindrical, 7 to 9-celled, about 50 x 4 μ. (Pl. IV, 38-40.)

On *Psidium guayava.* Kauai: Waimea, June 16, no. 542.

This fungus resembles Limacinia in its transversely septate spores but differs in the possession of paraphyses and in the shape of spores which are long and pointed.

The fungus described above is associated with many fungi. *Chaetothyrium hawaiiense* and *Phaeosaccardinula morindae* are also found in great abundance. The colonies appear as black, sooty, irregular patches, varying from a few millimeters to almost covering the whole surface. They are amphigenous, though more abundant on the upper portion of the leaf.

37. PHRAGMOCAPNIAS Theiss. and Syd.
Ann Myc. vol. 15, p. 480, 1917

No. 80. **Phragmocapnias smilicina** Mendoza, n. sp.

Mycelium dematioid, constricted, dark brown, irregularly branched; perithecia not stalked, globular, few, ostiolate, about 80-120 μ in diameter; asci numerous, ovate, aparaphysate, 8-spored, about 34 x 22 μ; spores ovate, hyaline when young, brown when mature, constricted, 3-septate, about 26 x 8 μ. (See Pl. IV, 41-44.)

On *Smilax sp.* Oahu: Olympus, June 24, nos. 670 and 981.

On *Pelea sp.* Oahu: Olympus, June 24, no. 670.

The characters of my fungus resemble those of Phragmocapnias sufficiently to permit its inclusion in that genus. It differs, however, from *P. betle* Syd. and Butl., which is the type species, in having 3-septate spores. In the size of spores it also differs from *Limacinia resinae* Sacc. and Bress., *L. crassa* Patt. and *L. callitris* (McAlp.) Theiss., which were later put under the genus Phragmocapnias. *P. juniperina* (Cke.) Theiss. has cylindrical celled-mycelium, while my fungus has a beaded one.

This fungus is associated with several fungi which were not determined, owing to the absence of ascigerous bodies. *Plochmopeltidella smilicina* is also found in abundance. The colonies appear as black, sooty, irregular patches varying from less than a millimeter to almost a centimeter in diameter and sometimes covering the whole surface of the leaf. They are strictly epiphyllous.

38. PHAEOSACCARDINULA P. Henn., Hedwigia vol. 44, p. 67, 1905

No. 81. **Phaeosaccardinula morindae** Mendoza n. sp.

Mycelium hyaline to straw-colored, in a mat-like weft, composed mainly of ovoid cells interwoven with long cylindrical cells; perithecia numerous, globular, gelatinous, greenish to dark brown, ostiolate, about 220 μ in diameter; ostiole with no definite border, more or less transparent; asci numerous, ovate, 8-spored, aparaphysate, about 44 x 30 μ; spores muriform, hyaline, 4-septate either obliquely or longitudinally, about 27 x 10 μ. (See Pl. v, 45-48.)

On *Morinda citrifolia.* Oahu: Hakipuu, June 6, Albert F. Judd's property, no. 572.

This fungus agrees with the genus Phaeosaccardinula in characters, but it differs from *Ph. diospyricola* P. Henn. in the septation of spores and the absence of paraphyses and from other species in the size and shape of spores. *Ph. roseospora* v. Höhn. has very long cylindrical spores differing from those of my fungus. Comparisons made with the descriptions of *P. ficina* Syd., *P. malloti* (Rehm.) Theiss., *P. butleri* Syd., *P. theae* Syd. and But., *P. samoensis* v. Höhn., *P. matrini* (E. and S.) v. Höhn., *P. costaricensis* (Speg.) Theiss., and *P. tahitiensis* (Pat.) Theiss. showed that *P. morindae* does not agree with any of them in the size and shape of spores.

The fungus is associated with several fungi, one of them probably a species of Chaetothyrium. The colonies appear as black, thin, leathery, sooty patches varying from less than a millimeter to almost covering the whole surface of the leaf and are usually epiphyllous, though sometimes found on the lower portion.

During the study many well-defined morphological forms such as mycelium, setae, conidiophores, conidia and pycnidia were found, but without perithecia. Many leaves examined were densely coated with sooty mould that on examination proved to consist of mycelium only, or of mycelium and setae only, or again of only mycelium and pycnidia or pycniospores. In the early part of the study records were made by drawings and descriptions of such morphological forms with the hope that examination of additional specimens might reveal the perithecial connection. In some specimens, though not in all, the ascigerous forms have thus been found. It is deemed wise to present figures and descriptions of these definite morphological structures even though the ascigerous stage is as yet unknown, recognizing that many of the structures pertain to unknown ascigerous species, though it is quite possible that some—perhaps many—of these morphological units have lost entirely the power of producing perithecia. I do not deem it wise to assign names to those detached morphological forms and therefore refer to them by number only. A key to those forms is as follows:

KEY TO MORPHOLOGICAL FORMS

Mycelium

A. Beaded
 1. Beads large
 a. Constricted, echinulate Form 1
 b. Constricted, not echinulate Form 2
 2. Beads small
 a. Constricted Form 3

B. Non-beaded
 1. Straw-colored, cells cylindrical Form 4
 2. Dematioid-membranous in a loose mat Form 5
 3. Cells dark cylindrical small, varying to large, finely reticulate Form 6

Setae

A. Variable types arising from a closely woven, straw-colored mycelium Form 7
B. Borne only on the perithecia, colorless, cystidium-like, obtuse Form 8
C. Dark-brown, gradually tapering toward the end Form 9
D. Arising from a beaded-mycelium, sometimes with small branches at the end Form 10

Pycnidia

A. Numerous, of many sizes and shapes Form 11
B. Few, globular to oval
 1. Borne on finely reticulate mycelium Form 12
 2. Borne on constricted, echinulate mycelium Form 13
 3. Borne on constricted non-echinulate mycelium Form 14

FORM 1

Fungus consists only of mycelium, composed of beaded, constricted cells; irregularly many-branched. The mycelial branches taper toward the end, the cells becoming smaller and smaller. Mycelium varies greatly in length; some threads short, others extremely long overlapping one another; individual cells more or less irregular in shape ranging from oval to nearly spherical and in size 7-16 × 5-12 μ; the color

ranging from yellow to dark brown. This form is very common with the sooty moulds and is known to be the mycelial stage pertaining to several distinct ascigerous genera—for example, Parascorias and Phragmocapnias; but most specimens of this form bear no spores. The type of pycnidium similar to those shown in Plate v, 14, is occasionally seen. (See Pl. v, 1A and 1B.)

FORM 2

Fungus consisting of mycelium, composed of cylindrical to beaded cells; mycelium yellow to brown in color; cells echinulate, with small spines, 18-32 × 12-16 μ in size. This form differs from Form 1 in the echinulation and arrangement of the cells. Form 1 is always found in great abundance forming a sooty coating on the surface of the plant while Form 2 is seldom found. No form of perithecium is ever found on this mycelium, but pycnidia evidently like that shown in Plate IV, 14, are occasionally found at the end of the branch. (See Pl. v, 2.)

FORM 3

Mycelium mat-like, irregularly branched, honey-yellow to almost green, composed of beaded cells 4-11 × 205 μ in size. This form differs from Form 1, since it has smaller cells and more matted arrangement. Pycnidia of variable size and shapes such as those shown in Plate IV, 11, were occasionally found borne on this kind of mycelium. *Antennellina hawaiiensis* has a mycelium indistinguishable from this form. (See Pl. v, 3.)

FORM 4

Mycelium composed of short or long cylindrical cells, pale to yellow, irregularly branched, forming a loose weft. Cells are 12-21 × 3-7 μ. This type of fungus is often found, especially in the Hawaiian material, and is always associated with the Form 1. The two mycelia form separate layers, the beaded one being on top. (See Pl. v, 4.)

FORM 5

Mycelium dematioid, membranous, forming a close weft, crossed by long cylindrical cells, pale to honey-yellow; ovoid cells 469 × 2-6 μ; mycelium sometimes setose; setae black, stout, pointed at the end. This type of mycelium is often found and many times is associated with other fungi. In several of the fungi studied—namely, *Phaeosaccardinula morindae, Chaetothyrium straussiae* and *Treubiomyces pulchrimus* the mycelial stage was similar to this form. (See Pl. v, 5A and 5B.)

FORM 6

Decumbent portion of the mycelium composed of threads made up of small cylindrical cells which branch, giving rise to threads of large finely recticulated, more or less beaded, cells. Decumbent mycelium yellow to dark-brown; cylindrical cells about 11 × 4 μ; large beaded cells about 25 × 12 μ. The fungus appears like a tiny cobweb on the surface of the leaf. Occasionally a pycnidium borne at the tip of the mycelium, like that in Plate v, 12, was found, but no spores. (See Pl. v, 6.)

FORM 7

Setae apparently very similar to those under discussion have been described and figured in connection with two genera of the Capnodiaceae—namely, Chaetothyrium and Treubiomyces, in which the setae are borne either on a mycelial net-work or on perithecia or both. The chief character setting them off from ordinary setae, such for example as in Colletotrichum, Volutella, etc., is that they are averaging about 4 μ wide near the base.

This form of setae varies in type, size, and mode of formation. It is generally black, stout, acute and usually, though not always, found coated with a layer of pale, straw-colored cells (Plate v, 7A and 7B). It is often found in great abundance, many hundreds of them within an area of a millimeter square. They vary in size from 48 to 100 μ long and 4 to 5 μ thick near the base. Sometimes the setae are divided into two o four apical forks (Pl. IV, 7C and 7D.) This branchin form is found only on the mycelium. Setae of very similar nature are sometimes found constructed as though two setae have joined together at their apices (Pl. IV, 7E), that is to say, they possess two bases but no apical region. The whole structure is about 140 μ long. (See Pl. v, 7A, 7B, 7C, 7D and 7E.)

FORM 8

Setae hyaline, cystidium-like, obtuse, only borne on the perithecia, from 20 to as many as 35 on a single perithecium, average about 45 μ long and 10 μ in diameter. This form is not very common with the sooty moulds. *Doratospora guianensis,* one of the fungi studied, bears the same setae on its perithecia. (See Pl. v, 8.)

FORM 9

Setae dark brown to almost black, generally slender, gradually tapering at the end, acute, borne on the mycelium and on the perithecium, average about 132 μ long and 9 μ wide near the base. This type is not often found in the sooty moulds. (See Pl. v, 9.)

FORM 10

Setae dark brown to black, beaded, with two to four branches at the end, average size about 300 μ long and 17 μ wide near the base; branches about 16 μ long and 7 μ thick, borne on a beaded mycelium. The mycelium that bears these setae is different from any of those beaded mycelia previously described. It has small, black, non-echinulated, non-reticulated cells. This mycelium rarely branches. (See Pl. v, 10.)

FORM 11

This form of pycnidium sometimes occurs in great abundance. It is of indefinite shape. Although it generally varies from almost globular to cylindrical, yet it is sometimes found elongate to beak-like. The size varies from about 19 to 36 μ long and 9 to 36 μ in diameter. It is gelatinous and is provided with an ostiole surrounded by a fringe composed of cylindrical cells.

This pycnidium is borne on a mycelium composed of beaded cells very much like that of Form 3. *Antennellina hawaiiensis* has also a similar mycelium. The spores are numerous, hyaline, oval, one-celled and about 2 × 1 μ. (See Pl. v, 11.)

FORM 12

Pycnidia amber-colored to dark-brown, gelatinous, globular to oval, no ostiole, average about 70 × 40 μ. This type of pycnidium is rarely found and is borne on a mycelium like that of Form 6. It is different from any of the pycnidia of Form 11, since it is of uniform shape while those in Form 11 are of variable shape. It also differs from Forms 13 and 14, since it is borne on a finely reticulated mycelium. Form 13 is borne on an echinulated mycelium and Form 14 is borne on a simple beaded mycelium. (See Pl. v, 12.)

FORM 13

Pycnidia amber-colored to dark brown, gelatinous, globular to oval, no ostiole, average size about 60 × 36 μ. This type of pycnidium is borne on a reticulated mycelium similar to that of Plate v, 2. (See Pl. v, 13.)

FORM 14

Pycnidium globular to oval, amber-colored to dark brown, ostiolate, average size about 80 × 50 μ., borne on mycelium with beaded cells apparently like that in Form 1. (See Pl. v, 14.)

ERYSIPHACEAE

The representatives of this group, though commonly seen in the conidial stage, were in no instance found with perithecia, though special and careful search was made for these structures. This absence of perithecia was noted by me also in Porto Rico (179) and seems to be the normal condition in the tropics. Without perithecia it is impossible definitely to classify the mildews and they are therefore reported under the form genus Oidium with the Fungi Imperfecti. The following species are probably there represented.

39. MICROSPHAERA Lev. Ann. Sc. Nat. III, vol. 15; 154, 1851

No. 82. **Microsphaera euphorbiae** (Pk.) B. and C.

40. ERYSIPHE Hedw., Lév. in Ann. Sc. Nat. 15, 161, 1851

No. 83. **Erysiphe polygoni** DC.

No. 84. **Erysiphe cichoracearum** DC.

41. SPHAEROTHECA Lév. Ann. Sc. Nat. III, vol. 15, 138, 1851

No. 85. **Sphaerotheca humuli** (DC.) Burr.

No. 86. **Sphaerotheca pannosa** (Wallr.) Lév.

HEMISPHAERIALES

Theis. Ann. Myc., vol. 11, p. 468, 1913

KEY TO HAWAIIAN FAMILIES OF THE HEMISPHAERIALES

Perithecial covering radial
- Thallus filamentous
 - Ascoma innate
 - Ascoma subcuticular **Stigmataceae**
 - Ascoma superficial, hypothallus immersed **Polystomellaceae**
 - Ascoma and thallus superficial **Microthyriaceae**
- Thallus membranous **Trichopeltaceae**

Perithecial covering not radial **Hemisphaeriaceae**

Thallus both filamentous and membranous **Anomothallus**

STIGMATACEAE

42. AULACOSTROMA Sydow, Phil. Jour. Sci., vol. 9, sec. C, p. 176, 1914

No. 87. **Aulacostroma osmanthi** Stevens and Ryan n. sp.

Amphigenous, colonies at first forming small spots, later often becoming confluent, 1 cm. in diameter. Perithecia irregular, straight to curved, .3-1.1 mm. by

227 μ, black, margin brown; hyphae brown, 10 μ thick, cells of the epidermis only sparsely filled with mycelium. Asci 8-spored, spatulate, 25-30 × 100μ, paraphyses numerous, filiform, equalling the asci; no epithecium; spores inordinate, black, 1-septate, 14 × 32-35 μ, strongly constricted at the septum, and separating there. The two ends of the spores obtuse, and much darker than the median region. Differs from *A. palowanense* Syd. by having larger perithecia differently arranged, and larger asci and spores. (See Pl. VI, A, B; fig. 12.)

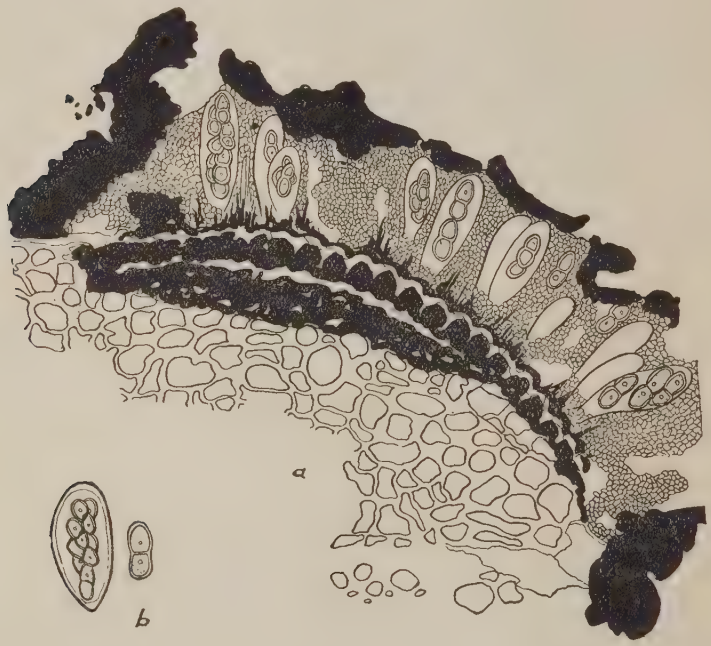


FIGURE 12.—*Aulacostroma osmanthii: a,* cross section of the perithecia showing asci and spores; *b,* ascus and spores.

On *Osmanthus sandwicensis.* Oahu: Waialae, June 21, 1921, A. F. Judd, collector. A superficial examination of the fungus would have placed it in the Hysteriales, but a careful study of the border of the perithecium revealed its radiate character, so that it falls clearly within the genus named above, which Theissen and Sydow (196, p. 403, 1917). place in an appendix to the Stigmataceae, though in earlier writings the same fungus was regarded as dothideaceous, or as belonging to the Hysteriaceae.

POLYSTOMELLACEAE [5]

KEY TO HAWAIIAN GENERA

Ascoma superficial with an intramatricular hypostroma.
Perithecia round **Polystomelleae**
Free mycelium lacking
Hymenia under the same membrane, only separated by a hyaline plectenchyma tissue
Paraphysate **43. Polystomella**
Aparaphysate **44. Pluriporus**

43. POLYSTOMELLA Speg. Fung. Guar.,

Anal. Soc. Ci. Argent., vol. 26, p. 53, 1888

No. 88. **Polystomella kaduae** Stevens and Ryan n. sp.

Stromata about 2 mm. in diameter, and 150 μ thick, hyaline with a surface layer about 18-30 μ thick, dark. Hyphostroma of palisade structure and dark, filling the epidermis; mycelium in the mesophyll scant. Surface view shows many ostioles (50 or more) and that the cover is radiate. Asci 8-spored, long stalked (including stalk about 25 × 110 μ) much thickened at the apex. Spores inordinate, oblong or tapering very slightly toward the ends. obtuse, hyaline, 1-septate, 7 × 22 μ, not constricted, paraphyses filamentose.

On *Kadua glomerata*. Hawaii: Kealakekua, July 25, no. 1005.

In spore size and other marked ways this differs from *P. pulcherrima* on Rubiaceae from South America. Nearly always if a stroma is found on one side of a leaf, a corresponding one is found on the opposite side. In section the palisade-like hypostroma in the epidermis is very evident. The constant coincidence of stromata on the two sides of the leaf suggests that the mycelium also penetrates the mesophyll. If so it is in very scant quantity for it is not seen.

44. PLURIPORUS Stevens and Ryan n. gen.

Free mycelium lacking, asci aparaphysate, spores brown, 2-celled. Perithecia disk form. ostioles numerous. Asci separated in a single row.

No. 89. **Pluriporus gouldiae** Stevens and Ryan n. sp.

Epiphyllous, perithecia 1-3 mm. in diameter, irregularly scattered, seldom confluent, numerous, black, carbonaceous, disk form, ostioles numerous, arranged in concentric circles. Asci 8-spored, clavate, separated, 11-34 × 22-45 μ, embedded in a single row, aparaphysate. Spores equally 2-celled, ovate, 1-septate, brown when mature, 9-10×5-32 μ, broadly rounded at the ends. Intercellular hypostroma present. (See Pl. VI, E; fig. 13.)

[5] The section on Polystomellaceae was written by Ruth W. Ryan and F. L. Stevens.

On *Gouldia coriacea.* Kauai: Waimea canyon pipe trail, June 15, 1921, no. 454 and no. 455 (type).

The genus presents certain characteristics of both the Polystomellaceae and the Myriangiaceae. The radiate character and the arrangement of

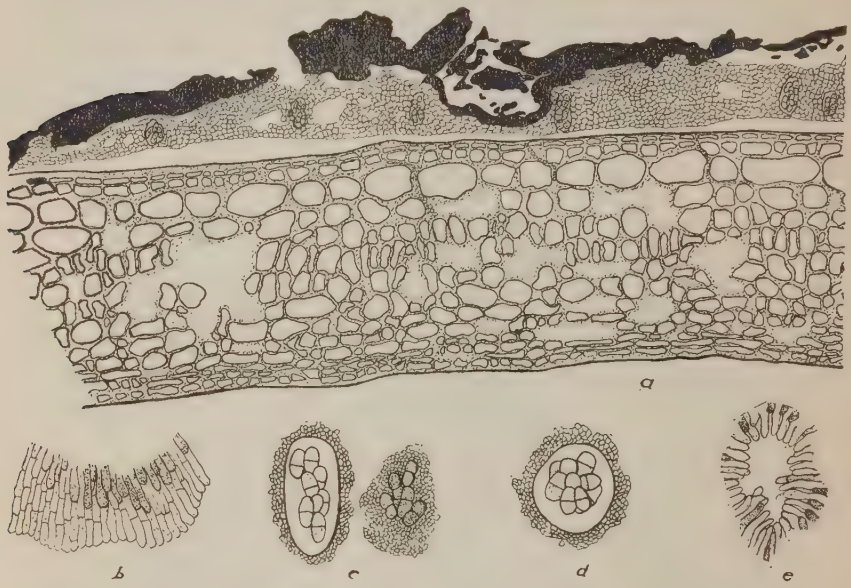


FIGURE 13.—*Pluriporus gouldiae: a,* cross section of the perithecia showing the fungus to be superficial, the asci solitary, and the whole ascogonium to be covered; *b,* showing radiate character of the ascogonium; *c,* asci and spores; *d,* spores seen through the ostiole; *e,* showing structure of the ostiole.

the irregularly shaped ostioles place it in the family Polystomellaceae near Rhagdolobium, but the separated solitary asci show kinship with the Myriangiaceae.

MICROTHYRIACEAE [6]

The Microthyriaceae of the islands of Hawaii are numerous and constitute an interesting part of the fungus flora, though heretofore none appears to have been authentically reported from the Territory. These fungi are in distribution practically like the meliolas—that is to say are limited to native plants and to the higher and wetter altitudes, and appear therefore to be historically of similar relation. So little is known

[6] The section on Microthyriaceae was written by Ruth W. Ryan and F. L. Stevens.

of the Microthyriaceae to the east and to the west of Hawaii that no generalizations are yet possible regarding the origin of this group. Most of the genera found in Hawaii—Lembosia and Asterina, for example—are known elsewhere and are for the most part of world-wide distribution.

Some of the species agree sufficiently with printed diagnoses to warrant the assumption that they are co-specific with previously described forms, and others must be regarded as new species or even as belonging to new genera. Certain of the new genera, such as Seynesiopeltis, are of exceptional interest.

The taxonomy of this group as based on the morphology of the forms previously known is summarized in two extensive articles, one by Theissen and Sydow (196, vol. 15, p. 413), and the other by Arnaud (3, vol. 16).

Since these two students arrive at systems of classification somewhat at variance, it is deemed best to present both systems in so far as they pertain to Hawaiian forms. The system of Theissen, based as it is so largely on spore septation and color, is distinctly artificial in character, while that of Arnaud is based on more fundamental morphological characters, though lacking of necessity in ease of application. The pertinent portions of both keys are reproduced here.

KEY TO THE HAWAIIAN MICROTHYRIACEAE

ADAPTED FROM THEISSEN AND SYDOW

Free mycelium lacking.....**Microthyrieae** Sacc. & Syd.
- Perithecia round
 - Spores 1-celled, hyaline, aparaphysate.....45 **Peltella** Rem.
 - Spores 1-celled, brown
 - Perithecia single.....46 **Seynesia** Sacc.
 - Perithecia 2-5 in a thallus, setose.....47 **Seynesiopeltis** Stev. and Ryan

Free mycelium present.....**Asterineae**
- Perithecia round
 - Spores hyaline
 - Spores 1-celled.....48 **Calothyriella** v. Höhn
 - Spores 2-celled.....49 **Calothyrium** Th.
 - Spores 6-celled.....50 **Beelia** Stev. and Ryan
 - Spores brown
 - Spores 1-celled.....51 **Calothyriopeltis** Stev. and Ryan
 - Spores 2-celled.....
 - Hyphopodiate
 - Mycelial conidia 4-celled.....52 **Clypeolella** v. Höhn
 - Mycelial conidia 1-celled or lacking.....53 **Asterina** Lév.
 - Non-hyphopodiate.....54 **Asterinella** Th.
- Perithecia linear
 - Asci 8-spored, spores 2-celled, brown
 - Hyphopodiate
 - Paraphysate.....55 **Lembosia** Lév.
 - Non-hyphopodiate
 - Aparaphysate.....56 **Echidnodella** Syd. and Th.
 - Paraphysate.....57 **Echidnodes** Syd. and Th.
 - Asci 8-spored, spores hyaline, aparaphysate.....58 **Aulographum** v. Höhn

KEY TO THE HAWAIIAN MICROTHYRIACEAE

ADAPTED FROM ARNAUD

Tribe I. Microthyrieés Speg. (not Sacc. and Syd).
Polystomellineés Th. and Syd. (emend Arnaud).
Perithecia large, several locules, external mycelium often lacking.
Locule round.
Paraphysate, ostioles round, spores 2-celled, hyaline.....**Polystomella** Speg.
Aparaphysate, ostioles numerous.....**Pluriporus** Stev. & Ryan
Wardineés
Asci in a rosette with a crown of peripheral tissue
Mycelium without stigmopodia
Spores brown, 2-celled.....**Asterinella** Th.
Spores hyaline, 2-celled.....**Microthyrium** (Calothyrium) Desm.
Spores hyaline 1-celled.....**Calothyriella** v. Höhn
Mycelium with stigmopodia
Spores brown, 1-celled.....**Calothyriopeltis** Stev. and Ryan
Eu-wardinées
Asci in parallel arrangement
External mycelium without stigmopodia
Spores dark, 6-celled.....**Beelia** Stev. and Ryan
External mycelium with hyphopodia
Asci embedded in paraphysate tissue.....**Asterina** Lév.
Asci aparaphysate, embedded in a jelly, perithecia gelatinized,
spores 2-celled, brown.....**Questieria** Arn.
(Clypeolella v. Höhn.)
Seynesiellinées
Perithecia unilocular, united by a common internal mycelium
Asci parallel, paraphysate
Setose.....**Seynesiopeltis** Stev. and Ryan
Not setose.....(Seynesia) **Seynesiella** Arn.
Asci hidden in a rosette and converging toward the center
Spores 1-celled.....(Peltella) **Myiocopron** Speg.
Tribe II. Hemihysteriées Speg. (Emend. Arn.)
Perithecia elongated, stroma unilocular, in general united on a common internal or external mycelium.
Morenoellinés Arn.
Mycelium external
Stigmocysts terminating the special lateral branches
Asci 8-spored, spores brown, 2-celled.
Hyphopodiate and paraphysate.....**Lembosia** Lév.
Non-hyphopodiate
Paraphysate.....**Echidnodes** Th.
Aparaphysate.....**Echidnodella** Th.
Morenoinées
Mycelium internal.....**Aulographum** v. Höhn. 14

One key is adapted from the keys scattered through Arnaud (3, vol. 16) and the other from keys by Theissen (196, vol. 15, p. 420). Both Arnaud and Theissen treat eight of the genera found in the Hawaiian species. Three other genera Theissen describes but no reference to them or any indication of a place for them can be found in Arnaud's key. From the descriptions of the genera given by Theissen and from the study of

them, they have been inserted in Arnaud's key. The three new genera have been inserted in both keys.

The genus Myiocopron in Arnaud includes Theissen's genus Peltella, from which it differs in the character of its spore color. Seynesiella includes Seynesia. As the fungi are not well known, Arnaud does not separate them. Calothyriopeltis n. gen. is like Calothyriella but has brown spores instead of hyaline. Investigations later may show that the species of Calothyriella were immature specimens of Calothyriopeltis. Seynesiopeltis n. gen. differs from Seynesia by having several perithecia attached to the center of a disk shaped, radiate thallus. It is also setose. Pleuriporus n. gen. is near Polystomella. It is aparaphysate and has numerous ostioles. The genus Microthyrium in Arnaud's key includes Calothyrium, which Theissen sets up as a new genus, distinguished from Microthyrium by having an external mycelium. The genus Aulographella is included in Aulographum by Arnaud. He makes no distinction on its having a free mycelium.

45. PELTELLA Sydow, Ann. Myc., vol. 15, p. 237, 1917

No. 90. **Peltella freycinetiae** Stevens and Ryan n. sp.

Perithecia 28 μ in diameter, carbonaceous, ostiolate, margin fimbriate. No free mycelium. Asci 55-60 × 29-26 μ, spatulate, aparaphysate. Spores 1-celled, hyaline, 5-7×12-17 μ, spatulate.

On *Freycinetia arnotti.* Oahu: Wahiawa, June 3, 1921, no. 977 (type).

46. SEYNESIA Sacc. Syll. Fung., vol. 2, p. 668, 1883

No. 91. **Seynesia atkinsonii** Stevens and Ryan n. sp.

Perithecia 120 μ in diameter, ostiolate, margin fimbriate, free mycelium lacking. Asci cylindrical, 29-24×60-94 μ, abundant, aparaphysate. Spores brown, 2-celled, cells rounded on the free ends, heavy walled, 12×22 μ.

On *Freycinetia arnotti.* Oahu: Palolo valley, Mt. Olympus, June 16, 1921, no. 300 (type); Tantalus, collected by Lyon, 1909, nos. 87, 92.

A packet bearing the inscription Seynesia freycinetiae Atk., was compared with our material on Freycinetia, and the two fungi were determined to be identical. A diligent search revealed no description of the fungus by Atkinson. We herewith present our description of the fungus as *Seynesia atkinsonii.*

47. SEYNESIOPELTIS n. gen. Stevens and Ryan

Fungus body a nearly crustose radiate colony, bearing one to several perithecia. Free mycelium lacking. Spores 2-celled. Colony setose.

No. 92. **Seynesiopeltis tetraplasandrae** Stevens and Ryan n. sp.

Epiphyllous, colonies 1-2 mm. in diameter, irregularly scattered, often confluent, numerous. The fungus body circular, composed of radiating hyphae, septate, branching, olive-green, 5 μ thick, bearing black, disk-shaped perithecia, 113-227 μ in diameter. Asci 8-spored, spatulate, non-paraphysate, 169-180 × 36-45 μ. Spores green-brown, ovate, one septate, 21-43 × 12-18 μ, the lower cell about one and one-half times as large as the upper. Colony bearing black setae, 5×90-119 μ. (See Pl. VI, *F;* fig. 14, *a.*)



FIGURE 14.—Asci, spores and cross section: *a, Seynesiopeltis tetraplasandrae*—an ascus and spores; *b, Beelia suttoniae*—asci and spores. *c, Calothyriopeltis scaevolae*—asci and spores; *d, Echidnodes pisoniae*—cross section of perithecia showing asci, paraphyses, and spores.

On *Tetraplasandra meiandra.* Oahu: Wahiawa, July 31, 1921.—Maui: Kenohuau, 1908, in Forbes collection.

On *Tetrasplasandra hawaiiensis.* Hawaii: Hamakua, upper ditch trail, May 31, 1921 no. 1089 (type).

The fungus resembles Seynesia, but differs from it in having one to several perithecia in one fungous body, and bearing setae. It differs from Seynesiopeltis in not having immersed perithecia. In the specimens studied no ostiole was observed.

48. CALOTHYRIELLA v. Höhn. Ber. Deutsch. Bot. Ges., vol. 35, p. 251, 1917

No. 93. **Calothyriella osmanthi** Stevens and Ryan n. sp.

Hypophyllous, perithecia, 90 μ in diameter, irregularly scattered, forming confluent, numerous, black, round colonies. Asci 8-spored, clavate, 18×10 μ aparaphysate. Spores 1-celled, hyaline, 3-9× 1-2 μ, rounded at the ends. Free mycelium present, 3 μ thick. (See Pl. VI, *g.*)

On *Osmanthus sandwicensis.* Oahu: Maunalua, May 29, 1921, no. 135 (type). This species is smaller than *Calothyriella pinophylla.*

49. CALOTHYRIUM Theis. Ann. Myc., vol. 10, p. 160, 1912

KEY TO SPECIES OF CALOTHYRIUM

Spores hyaline, 2-celled.
Spores not appendaged; non-hyphopodiate
Perithecia 79-217 μ, spores 9 × 27 μ.....94 **C. suttoniae**
Perithecia 75-180 μ, spores 1×7-9 μ.....95 **C. osmanthi**

No. 94. **Calothyrium suttoniae** Stevens and Ryan n. sp.

Perithecia black, carbonaceous, often confluent, forming a colony 397-700 μ, single perithecia 79-217 μ in diameter. Free mycelium brown, 5 μ thick, slightly branched, septate, non-hyphopodiate. Asci ovate, 39-45 × 27-30 μ, embedded in the matrix, aparaphysate, 8-spored; spores hyaline, 2-celled, 9 × 27 μ, the lower cell larger and more rounded, heavy walled.

On *Suttonia sandwicensis*. Hawaii: Hamakua, upper ditch trail, July 31, 1921, no. 143 (type).

No. 95. **Calothyrium osmanthi** Stevens and Ryan n. sp.

Perithecia black, carbonaceous, round, 75-180 μ in diameter. Free mycelium present, brown, branching abundantly, 3 μ thick, non-hyphopodiate. Spores hyaline 2-celled, 1-3×7-9 μ, thin walled.

On *Osmanthus sandwicensis*. Oahu: Ahren's ditch trail, June 8, 1921, no. 290 (type).—Kauai: Kalalau trail, June 16, 1921.

50. BEELIA Stevens and Ryan n. gen.

Fungus forming colonies on the surface of the leaves. Perithecia black, radiate, ostiolate, on a free, brown, septate, branching mycelium. Asci globular, aparaphysate, embedded in the matrix; spores straw-colored, 6-celled.

Named in honor of M. Beeli in recognition of his work on fungi.

No. 96. **Beelia suttoniae** Stevens and Ryan n. sp.

Colonies 1-1.6 cm. in diameter, having scattered perithecia, 90-227 μ in diameter, on a free, brown, branching, septate, non-hyphopodiate mycelium, 5 μ thick; perithecia ostiolate, radiate, round, carbonaceous. Asci 72-63 × 45-39 μ, 8-spored, nearly globular, aparaphysate; spores hyaline, 6-celled, when mature straw colored, spores 36-32 × 14-12 μ. Young perithecia show the radiate character of the perithecia around the edge. Later on becoming gelatinized, it is not so easily perceived. (See fig. 14, *b*.)

On *Suttonia lanaiensis*. Lanai, no. 421. Collected by Munro.

51. CALOTHYRIOPELTIS Stevens and Ryan n. gen.

Perithecia round, free mycelium present, hyphopodiate, spores brown, 1-celled, aparaphysate, asci scattered. This genus resembles Calothyriella but has brown 1-celled spores.

KEY TO SPECIES OF CALOTHYRIOPELTIS

Spores brown, 1-celled

Perithecia 90-330 μ, spores 7-9×12-16 μ 97 **C. scaevolae**
Perithecia 270 μ in diameter, spores 9×14 μ 99 **C. metrosideri**
Perithecia 90×170 μ, spores 9×18-21 μ 98 **C. clermontiae**

No. 97. **Calothyriopeltis scaevolae** Stevens and Ryan n. sp.

Perithecia black, radiate, often confluent, 90-331 μ in diameter. Free mycelium present, 5 μ thick; hyphopodia 2-celled, lobed, the upper cell with a hyaline spot; asci 25-27 × 22 μ, aparaphysate; spores 7-9 × 12-16 μ, zoned. (See fig. 14, *c*.)

On *Scaevola* sp. Kauai: Kalalau trail, June 16, 1921, no. 476 (type); no. 473.

No. 98. **Calothyriopeltis clermontiae** Stevens and Ryan n. sp.

Perithecia round, black, radiate, often confluent, 90-170 μ in diameter. Mycelium 7 μ thick, hyphopodia 2-celled, alternate, cylindrical, often lobed, 5-7 × 12-14 μ. Asci 21-29×31-38 μ, 8-spored. Spores brown, 1-celled, 9×18-21 μ, heavy walled, aparaphysate.

On *Clermontia oblongifolia*. Kauai: Kalalau trail, June 16, 1921, no. 478 (type).

No. 99. **Calothyriopeltis metrosideri** Stevens and Ryan n. sp.

Perithecia black, round, radiate, forming carbonaceous colonies 3-5 mm. in diameter, ostiolate, 270 μ in diameter; free mycelium, black-brown, branched, 5 μ thick; hyphopodia alternate, 1-celled, lobed, 4-5 × 8-12 μ. Asci oval, 23-30 × 32-38 μ, aparaphysate; spores brown, smooth, 1-celled, 9 × 14 μ.

On *Metrosideros* sp. Oahu: Tantalus, June 22, 1921, no. 636 (type). On *Lobelia* sp. Hawaii: Kealakekua, July 25, 1921, no. 979.

This species is larger than *Calothyriopeltis scaevolae*, the spores are not zoned, and the hypophodia are smaller and differently lobed. The species on Lobelia agrees with that on Metrosideros in all the measurements, but is grey-green rather than brown in color.

52. CLYPEOLELLA v. Höhn. Sitzungsber. K. Acad. Wiss. Wien, Abt. 1, vol. 119, p. 403, no. 478, 1910.

No. 100. **Clypeolella clermontiae** Stevens and Ryan n. sp.

Perithecia round, carbonaceous, 86-90 μ in diameter; free mycelium present, brown, septate, much branched, 5 μ thick, hypophodia 2-celled, lobed, 7×14 μ, alternate. Asci ovate, aparaphysate, 36-45×27-30 μ. Spores brown, 2-celled, smooth, 9-13×21-19 μ.

On Clermontia sp. Maui, Iao Valley, Sept. 7, 1921, no. 1154 b (type).

53. ASTERINA Lév. Ann. Sci. Nat. 3rd ser., vol. 3, p. 59, 1845

KEY TO SPECIES OF ASTERINA

Euasterina
- Perithecia without a basal membrane, asci on colorless, branched hyphae with erect paraphyses, hyphopodiate
 - Hyphopodia 2-celled, asci clavate 107 **A. lobeliae**

Dimerosporium
- Perithecia without a basal membrane, aparaphysate, asci arising from branched hyaline hyphae.
 - Hyphopodia typical
 - Hyphopodia opposite 106 **A. suttonia**
 - Hyphopodia alternate
 - Hyphopodia 1-celled
 - Hyphopodial margin regular, at least not regularly lobed.
 - Hyphopodia cylindrical to club shaped
 - Spores 9-18 × 1621 μ 104 **A. clermontiae**
 - Spores 18-22 μ 108 **A. rickii**

Hyphopodia round, oval or short and broadly cylindrical.
Spores 13 μ long.....110 **A. aspiddii**
Spores 15-22 μ long
Perithecia 45-240 μ in diameter.....101 **A. gouldiae**
Perithecia 100-140 μ.....109 **A. delitescens**
Hyphopodia lobed
Perithecia 80-120 μ, mycelial hyphae 3 μ thick.....102 **A. ildefonsiae**
Perithecia 100-140 μ, mycelial hyphae 9 μ thick.....103 **A. kauaiensis**
Perithecia 48-99 μ, mycelial hyphae 1-2 μ thick.....105 **A. phyllostegiae**

No. 101. **Asterina gouldiae** Stevens and Ryan n. sp.

Amphigenous, perithecia black, radiate, 45-240 μ in diameter, round, forming colonies 5-9 mm. in diameter. Free mycelium present, hyphopodia 1-celled, round, sessile, 10-12 μ broad; mycelium brown, 7 μ thick; hyphae of perithecia 3 μ thick. Asci 63-72 × 27-39 μ, ovate, aparaphysate; spores 2-celled, brown, 7 × 16 μ, equal.

On *Gouldia coriacea.* Kauai: Kalalau trail, June 16, 1921, no. 494(type).

The perithecia and asci are larger than those of *Asterina delitescens,* while the spores are smaller.

No. 102. **Asterina ildefonsiae** (Rehm) Theis. Hedwigia, vol. 34, p. 101, 1895

On *Cloaxylon sandwicense.* Kauai: Waimea pipe trail, no. 448.

Fungus on *Claoxylon sandwicense* answers the description of *A. ildefonsiae,* except that the asci are slightly larger in the material examined.

No. 103. **Asterina kauaiensis** Stevens and Ryan n. sp.

Perithecia black, radiate, 144 μ in diameter; free mycelium brown, 9 μ thick, hyphopodia 2-celled, lobed; asci 32-36 μ, aparaphysate; spores 9 × 18 μ, brown, 2-celled.

On unknown host. Kauai: Kalalau trail, June 16, 1921, no. 479 (type).

No. 104. **Asterina clermontiae** Stevens and Ryan n. sp.

Perithecia black, ostiolate, round, 90-180 μ in diameter. Free mycelium brown, 5 μ thick; hyphopodia alternate, cylindrical, 3-5 × 11-16 μ, occasionally lobed. Asci ovate to rounded, 21-32 × 36-45 μ, aparaphysate. Spores brown, 2-celled, 9-18 × 16-21 μ, smooth, tapering at the ends.

On *Clermontia* sp. Maui: Iao valley, Sept. 7, 1921, no. 1154 (type).

No. 105. **Asterina phyllostegiae** Stevens and Ryan n. sp.

Perithecia black, disk form, diameter 48-99 μ; free mycelium present, brown, 3 μ thick, much branched; hyphopodia 2-celled, slightly lobed. Asci globose to ovate, 10-12 × 21-32 μ, aparaphysate; spores brown, 2-celled.

On *Phyllostegia sp.* Oahu: Olympus, June 24, 1921, no. 718 (type).

This species is near *Asterina ildefonsiae,* but differs from it in being much smaller.

No. 106. **Asterina suttoniae** Stevens and Ryan n. sp.

Perithecia black, disk form, diameter 79-384 μ, amphigenous; free mycelium present, brown, hyphopodia opposite, 2-celled, 7-9 μ long, the upper cell with a hyaline spot. Mycelium 9 μ thick, spores brown, 2-celled, verrucose, 9 × 18 μ.

On *Suttonia sp.* Oahu: Kuliouou. Collected by Caum, May 29, 1921, no. 143 (type). Near *Asterina elmeri,* but is much smaller.

No. 107. **Asterina lobeliae** Stevens and Ryan n. sp.

Perithecia black, radiate, often confluent, 216 μ in diameter, epiphyllous. Free mycelium present, hyphopodia 2-celled, lobed and curled; hyphae 5 μ thick; asci parphysate 9-14 × 39-54 μ, spores 3-5 × 12-14 μ.

On *Lobelia sp.* Kauai: no. 1063 (type).

This fungus is smaller than *Asterina pemphidioides;* asci are clavate rather than ellipsoid, and the spores are smaller.

No. 108. **Asterina rickii** Theis. Dec. Fung. Brasil. 68, 1910

Material studied falls under the description for *A. rickii* given by Theissen.

On *Meterosideros sp.* Oahu: Kuliouou, May 29, 1921, no. 142 (type), collected by Caum, also by Stevens: Olympus, June 24, 1921.—Hawaii: Hamakua, upper ditch trail, July 28, 1921.—Kauai: Waimea pipe trail canyon, June 15, 1921.

No. 109. **Asterina delitescens** Ell. and Mart., Am. Nat., vol. 17, p. 1381, 1883

Material studied agrees with the description as given.

On *Vaccinium sp.* Hawaii: Kilauea, July 14, 16, 31, 1921; Oahu: Tantalus, June 22, 1921, no. 820 (type).

No. 110. **Asterina aspidii** Theis. Hedwigia, vol. 43, p. 141, 1904.

On *Maba sandwicensis.* Oahu: Kuliouou, May 29, 1921, no. 145 (type). Collected by Caum.

No. 111. **Asterina fimbriata** Kalch. and Cooke, Grevillea, vol. 9, p. 33, 1880

The material examined agrees with the description for *A. fimbriata.* This fungus is hypophyllous.

On *Lobelia sp.* Kauai: no. 1063 (type).

54. ASTERINELLA Theis., Ann. Myc., vol. 10, p. 160, 1912

Perithecial context, smoky brown to black
- Asci globose or ovate-elliptical
 - Spores smooth
 - Spores 12-16 × 27-32 μ 112 **A. humiriae**
 - Spores 8 × 16-18 μ 113 **A. intensa**
 - Spores 5 × 12 μ 114 **A. mabae**

No. 112. **Asterinella humiriae** (P. Henn.) Theis. Broteria, vol. 10, p. 121, 1912

This fungus agrees in all particulars with the description given by Theissen.

On *Byronia sandwicensis.* Kauai: Kalalau trail, June 16, 1921, no. 493 (type).—Oahu: Tantalus, June 22, 1921; Palolo valley and Mt. Olympus, June 10, 1921.—Hawaii: Hamakua, upper ditch trail, July 31, 1921.—Maui: Olinda pipe line, Sept. 5, 1921.

This fungus is also in Forbes collection: Kauai, 1909, no. 212, and Maui, 1909, no 459.

No. 113. **Asterinella intensa** (Cooke and Mass.) Theis. Broteria, vol. 10, p. 120, 1912

This fungus agrees in all details with the descriptions given by Theissen.

On *Osmanthus sandwicensis.* Oahu: Makaleha valley, July 8, 1922. Collected by E. L. Caum.

No. 114. **Asterinella mabae** Stevens and Ryan n. sp.

Perithecia epiphyllous, black, radiate, ostiolate, 162 μ in diameter; free mycelium brown, much branched, 5 μ thick; asci ovate, 23 × 36 μ, 8-spored, aparaphysate. Spores dark brown, 1-septate, 5 × 12 μ.

On *Maba sandwicensis.* Oahu: Makaleha valley, 1914, no. 1995.

On *Maba hillebrandii.* Oahu: Makaleha valley, June 8, 1922.

This fungus is closely related to *Asterina intensa,* but is much smaller.

55. LEMBOSIA Lév. Ann. Sci. Nat., 3rd ser., vol. 3, p. 58, 1845

No. 115. **Lembosia eucalypti** Stevens and Dixon n. sp.

Spot amphigenous, usually arranged concentrically around a scale nipple, 1-2 × .5-.75 mm. black, cleft throughout the whole length; margin distinctly radiate. Asci 8-spored, 4-6 × 34 μ, borne in regular rows with an epithecium. Spores discharged from the base of the ascus, 2-4 × 11-14 μ, hyaline, 1-septate, not constricted at the septa. The spore gradually tapers at the ends, which are rounded, and slightly narrower than the middle of the spore.

On *Eucalyptus sp.* Hawaii: Kilauea, July 16, 1921, no. 874 (type).

56. ECHIDNODELLA Theis. and Syd. Ann. Myc., vol. 15, p. 422, 1917

Spores brown, 2-celled, aparaphysate

Perithecia 500-650 μ long 116 **E. cocculii**
Perithecia 397-227 μ long 117 **E. mabae**
Perithecia 72-63 μ long 118 **E. raillardiae**

No. 116. **Echidnodella cocculi** Stevens and Ryan n. sp.

Epiphyllous, scattered, colonies small, seldom confluent. Hyphae septate, fuscous, slender, 1.8 μ thick, branching abundantly, non-hyphopodiate. Perithecia gregarious, round when young becoming linear when mature, 500-650 × 200-284 μ. Straight, curved or forked, dehiscing by a longitudinal slit almost the length of the perithecium. Asci 8-spored, aparaphysate, spatulate, sessile, rounded at the apex and having a thickened cap, 9 μ. Asci 14-18 × 36-41 μ. Spores, inordinate, brown when mature, heavy walled, 2-celled, 7-9 × 21-23μ, cells approximately the same size. Microtome sections show the fungus as entirely superficial. A few setae were observed. (See Pl. VII, *A*.)

On *Cocculus ferrandianus*. Hawaii: Kealakekua, July 21, 1922, no. 998a, and July 25, 1921, no. 989; Hilo, July 10, no. 767.—Oahu: Nuuanu valley, Jan., 1912. (Forbes no. 1729.)

It differs from *E. hypolepides* in not being effuse nor occurring along the midrib, seldom confluent, hyphae more slender, perithecia larger, asci spatulate rather than elliptic-ovate, spores larger, cells equal.

No. 117. **Echidnodella mabae** Stevens and Ryan n. sp.

Epiphyllous, perithecia carbonaceous, scattered, 227 × 397 μ, splitting by a longitudinal slit, radiate. Free mycelium branched, dark brown, 3.6 μ thick; asci 33 × 54 μ, embedded in the matrix, aparaphysate, and non-hyphopodiate. Spores 2-celled, dark brown, lower cell round, upper cell ovate, 7 × 21.6 μ.

On *Maba sandwicensis* DC. Oahu: Makaleha valley, Jan. 8, 1922, O. A. Sweezy, collector.

No. 118. **Echidnodella raillardiae** Stevens and Ryan n. sp.

Ephiphyllous, perithecia linear, 63-72 μ long, radiate, irregularly scattered, numerous, black, carbonaceous, ostiolate. Free mycelium present, brown, 3.6μ thick. Spores ovate, 1-septate, brown when mature, 3.6 × 8 μ.

On *Raillardia* sp. Hawaii: Kilauea, July 15, 1921, no. 853 (type). Asci were not observed as the material for study was not plentiful. If the fungus proves to be aparaphysate there is no question of it belonging to Echidnodella. On the other hand if it is paraphysate it will go to Echidnodes.

57. ECHIDNODES Theis. and Syd. Ann. Myc., vol. 15, p. 422, 1917

No. 119. **Echidnodes pisoniae** Stevens and Ryan n. sp.

Amphigenous, mostly epiphyllous, forming black colonies 5-9 mm. in diameter, often numerous, seldom confluent. Hyphae septate, brown, 3-5 μ thick, irregularly branching, often fasciculated, anastomosing, non-hyphopodiate. Perithecia irregularly scattered, occasionally confluent, numerous, carbonaceous, oblong ellipsoid, straight, curved or forked, 120-125 × 200-500 μ. Asci clavate, thickened at the apex, 20-21 × 43-50 μ. Paraphyses numerous, filiform, longer than the asci, with smoke colored, enlarged globose tips. Spores ovate, 1-septate, obtuse, constricted, brown when mature, 7 × 15-18 μ, the upper cell larger and more broadly round. Microtome sections showed the parasite superficial, bearing setae. These latter, however, were not observed in the other preparations of the material for identification. (Plate VI, *D*; fig. 14, *d*).

On *Pisonia umbellifera*. Oahu: Ahren's ditch trail, June 8, 1921, no. 288; 1917, no. 2494 O; and by Swezey in Makaleha valley, Jan. 8, 1922. Hawaii: mountain near Kilauea, collected by Forbes, October, 1916, no. 537-H.

On *Pisonia sandwicensis*. Oahu: Tantalus, June 22, 1921, No. 651 (type).

58. **AULOGRAPHELLA** v. Höhn. Ann. Myc., vol. 15, p. 367, 1917

No. 120. **Aulographella baumeae** Stevens and Ryan n. sp.

Amphigenous, perithecia black, linear, radiate, 100× 400 μ; free mycelium lacking. Hyphae of the perithecium 3 μ thick; asci obtuse, 10-14 × 25 μ; paraphyses indistinct. Spores 2-3 × 9 μ, 1-septate, hyaline.

On *Baumea meyenii*. Oahu: Waiahole ditch trail, June 12, 1921, no. 390 (type).

This species is smaller than A. *epilobii*.

59. **QUESTIERIA** Arnaud, Ann. École Nat. Agr. Montpelier.[1] vol. 10, p. 186, 1918.

No. 121. **Questieria euphorbiae** G. Arnaud n. sp.

Colonies brown, circular, usually 3-4 mm. in diameter, hyphophyllous; mycelium superficial, light brown, 6-7 μ thick, branching, at first at acute angles. Hyphopodia 1-celled, round to oval, 8 × 12 μ, forming haustoria in the epidermis similar to those of Meliola and of *Asterina puiggarii* (Speg) Th. Perithecia visible only with a lens, and then appearing black, variable in size, 50-100 μ in diameter for the perithecia bearing mature spores, formed from the septation of a hyphopodium. Structure at first radiate, rapidly becoming membranous, gelatinous and swollen, slightly colored, with an ostiole. Irregularly hemispherical as in all the species of the genus. Asci globular, or somewhat ovoid, 25-35 μ long; 8-spored; generally 2-6 asci in a perithecium; aparaphysate. Spores 2-celled, ovoid elongate, slightly constricted at the septum; at first hyaline, later light brown, 10-15 × 20-25 μ. Ascospores germinated on the leaf are dark brown and bear on the lower cell a hyphopodium and a germ tube. The upper cell bears 2 or 3 germ tubes. (Plate VII, B).

On *Euphorbia clusiaefolia*. Kauai: Waimea canyon pipe trail, June 15, 1921, no. 393 (type).

The genus Questieria Arnaud (3, vol. 16, p. 186) is probably identical with the genus Schiffnerula v. Höhn. I (87, vol. 118, p. 867; vol. 119, p. 412), (196, p. 469) previously described, this last genus which has been wrongly placed in the group Englerulacées (whose value is very doubtful), while the Questierias are incontestibly microthriaceous neighbors of Englerulaster and Asterina, etc. The genus Clypeolella v. Höhn., appears also to be a neighbor, but it has never been characterized in a convenient manner (3, vol. 16, p. 185).

[1] Description, discussion and illustrations furnished by Professor G. Arnaud.

The interest of the systematic mycologist strongly urges the abandoning of the law of priority for the genera or species badly described and classified. *Questieria euphorbiae* appears to be a neighbor of *Schiffnerula secunda* v. Höhn. (87, vol. 119, p. 412); but the latter has not shown conidia or bubilles, organs which exist in all the other species.

TRICHOPELTACEAE

Theisen, Centr. Bakt., Abt. 2, vol. 39, p. 625, 1913

The mycelial cells of the fungi of this family, instead of remaining distinct from their lateral neighbors and forming the usual fungous filaments, remain always in contact with the lateral cells, united to them, thus forming a cell plate, one cell thick, instead of mere separate filaments. These cell plates assume various forms, strap-shaped, circular, whorled, etc., according to the mode of division and growth of the cells. In general they present a striking resemblance to the cell plates of the Hepaticae, and thus constitute a unique group. (See Pl. VIII; figs. 15-19.)

Certain areas in the cell plates become thickened by the addition of one or more layers of cells below the primary layer, leading to the development of pycnidia or perithecia. Later, apparently from the pressure developed internally, one cell, followed by others, becomes ruptured at the top of the structure, producing a place of exit for the spores, a lysigenous pseudo-ostiole. (See figs. 16, *a-b*.) Spore cavities may be recognized very early, long before the break appears, by a slight darkening due to the increased thickness from the added layer or layers of cells. (See Pl. VIII; fig. 16.) Certain forms appear to be devoid of spore cavities and the function of reproduction is performed by conidia-like setae.

The first known representative of this group was described by Montagne (124, vol. 14, p. 328) in 1840 under the name *Asteroma labecula* and later transferred by him to the genus Asterina, (125, p. 255) and still later was transferred to the genus Trichopeltis of Spegazzini by von Höhnel (87, vol. 119, p. 456) who, recognizing the unique characters of these fungi, brought together into one group, under the name "Trichopelteen," the genera Trichopeltis, Trichopeltella, and Brefeldiella, leaving them, however, still in the Microthyriaceae. He says that *Asteroma labecula* Mont. and *Trichopeltis pulchella* Speg. belong to the same genus, and that Brefeldiella "ist ganz ähnlich gebaut."

Theissen (194, vol. 11, p. 468) in 1913 very properly proposes the establishment for these forms of a new family, the Trichopeltaceae, which he formally presents in 1914 (195, p. 625).

Theissen then proceeds, with only eight species in hand and with the material often immature, to distribute these forms in six genera, three of them new, and based, in the main, on the artificial distinctions of spore septation and color, together with that of thallus form.

In my own studies, with large collections available, I find that spore septation within the same perithecium is variable and that thallus form is also variable. These facts lead me to reject the genus Trichopeltina and to present the following classification for the Hawaiian forms:

KEY TO HAWAIIAN GENERA OF TRICHOPELTACEAE THEIS.

Asci present, spores hyaline
- Spores 1-2 septate 60. **Trichopeltis**

Asci absent **Trichopeltaceae imperfecti**
- Thallus setose 62. **Trichothallus**
- Pycnidia present 61. **Enthallopycnidium**

60. TRICHOPELTIS Speg. Bol. Acad. Nac. Ci. Cordoba, vol. 11, p. 571, 1889

This genus is characterized by Spegazzini as follows:

Mycelium fibris pro ratione majusculis membranaceo-applanatis vittaeformibus non costatis dendritico-ramulosis prosenchymatico-contextis efformatum; perithecia superficialia v. fibris tecta dimidiato-scutata parvula ostiolata; asci octispori; sporidia 2-septata hyalina. Genus nobilissimum, cujus *Trichopeltis reptans,* (B. et C.) Speg. (Cub. Fung. n. 734, sub Asterina) est.

The description of *Asterina reptans* (B. and C.) Cuban Fungi no. 734, as given (17, p. 373) by Berkeley, reads:

Stromate tenui subreticulato, peritheciis minutis e cellulis radiantibus constructis obsito; asci clavatis; sporidiis oblongis, subfusiformibus uniseptatis.

On leaves of Piper. Habit of a young epiphyllus *Collema.*

Some of the perithecia contain minute allantoid-spermatia. The specimens are young; so that the sporidia will not come out of asci, and therefore cannot be measured accurately.

The reference in the above description to "peritheciis-radiantibus" renders it quite certain that the fungus described as *Asterina reptans* in the Sylloge is not the same as that described by Spegazzini as the type of his genus Trichopeltis. Indeed, examination of specimen no. 734, Fungi Cubenses Wrightiana, which—bearing the original label "*Asterina reptans* B. & C. on Piper coll. C. Wright"—was very kindly loaned to me by Dr. Spegazzini, shows that it consists of some five or more leaf fragments all heavily covered by fungi. On microscopic examination these fungi prove to consist of several distinct species and even of several distinct genera. It therefore appears to me that though the genus Trichopeltis is based on Fungi Cubenses Wrightiana, no. 734, labeled in Spegazzini's collection, *Asterina reptans,* it is not really based on that

fungus, but on another fungus in the same packet. It may also be noted that the specimen issued by Ule as "no. 65 Myc. Braz." under the label "*Asterina reptans* cfr. B. & C." though without spores, is in the thallus characters quite a different species from any at present under discussion. Theissen and Sydow (196, vol. 15, p. 427), state that the specimen of *Trichopeltis reptans* referred to above, is immature and generically doubtful, and they therefore reject it as the type of the genus Trichopeltis, accepting instead the one other species known to them, *T. pulchella* Speg.

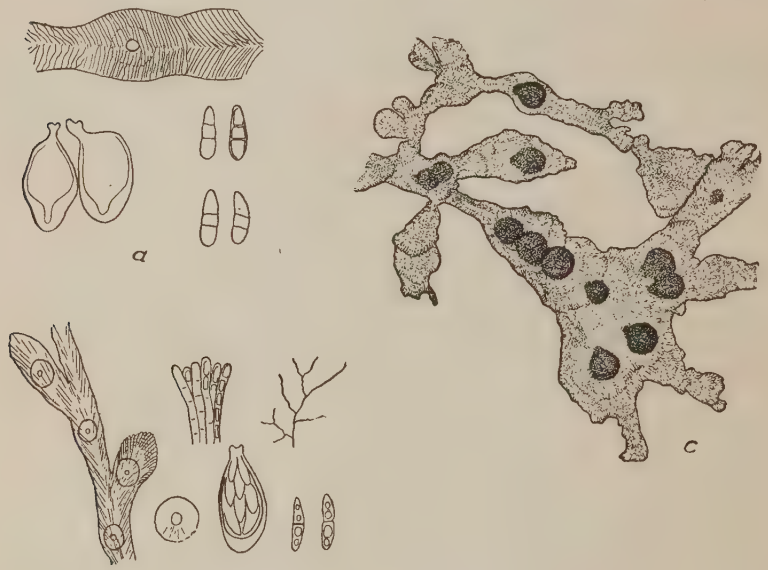


FIGURE 15.—Trichopeltis: *a, T. pulchella,* redrawn from Spegazzini's figures on his packet no. 2365—thallus, asci, and spores; *b, T. chilensis,* redrawn from Spegazzini's figures on his packet labelled *"Trichothyrium chilensis;" c, T. reptans* (No. 1054) on Straussia sp. showing general type of thallus, cell arrangement, and location of perithecia.

This procedure I regard as unwarranted, since the generic descriptions given by Spegazzini is adequate and the fungus on which it was founded is recognizable in Spegazzini's specimen. I therefore regard *T. reptans* as the type species of the genus, accepting Spegazzini's characterization and I give herewith a photomicrograph (Pl. IX, A) of a portion of a thallus from Spegazzini's specimen of F. C. no. 734, which I regard as the fungus intended by him as the type of this genus. I give also a photograph (Pl. IX, B) of the whole specimen. *Trichopeltis pulchella,* the type specimen of which was also kindly loaned to me by Spegazzini, is clearly

cogeneric with *T. reptans*. A photomicrograph of Spegazzini's type specimen is given (Pl. IX, C), also a reproduction of his laboratory drawings from the cover of his packet (fig. 15). *T. chilensis* Speg. is similarly shown in Plate IX, D, and in figure 15, *b*. Trichopeltina was proposed as a new genus by Theissen (195, p. 630) who distinguished it from Trichopeltis solely by the fact that the spores in Trichopeltis are 2-septate, while those of Trichopeltina are 1-septate. Since in my material I find spore septation very inconstant, both 2 and 3-celled spores occurring in the same perithecium, I regard this as a character insufficient for generic distinction, and regard all the species heretofore recorded as belonging to Trichopeltina as being of the genus Trichopeltis.

KEY TO SPECIES OF TRICHOPELTIS

Spore cells firmly articulated.....122. **T. reptans**
Spore cells not firmly articulated.....123. **T. rhyacoides**

No. 122. **Trichopeltis reptans** Speg. op. cit.

Not *Asterina reptans* B. & C.

On *Pelea kauaiensis*. Oahu: Tantalus, June 22, nos. 627 and 638.

On *Pelea sp.* Oahu: Palolo valley, June 10, nos. 297a and 346a; Olympus, June 24, nos. 670a and 682; Tantalus, June 22, no. 632.—Hawaii: Kilauea, July 13, no. 812; Waimea, July 29, no. 1137; Kealakekua, July 23, no. 986a, also collected by Fullaway and Giffard in 1919.

On *Metrosideros polymorpha*. Oahu: Tantalus, June 22, no. 633.—Hawaii: Hilo, flow of 1881, July 8, no. 740; between Hilo and Kilauea, July 10, no. 777; Kealakekau, July 25, nos. 983 and 976; Hamakua, upper ditch trail, July 28, no. 1027 and July 31, nos. 1059 and 1071.

On *Kadua glomerata*. Hawaii: Kealakekua, July 25, no. 1005.

On *Straussia sps.* Oahu: Waiahole, June 12, no. 400; Tantalus, June 22, no. 628.—Hawaii: Puna, July 9, nos. 755, 757, 758; between Hilo and Kilauea, July 10, no. 770; Kealakekua, July 23, no. 962; Waimea, July 30, no. 1054.

On *Psidium guayava*. Hawaii: Hilo, flow of 1881, July 8, no. 742.

On *Clermontia multiflora*. Oahu: Palolo valley. June 10, no. 330; Maui: Iao valley, Sept. 7, no. 1154.

On *Clermontia sps.* Oahu: Palolo valley, June 10, nos. 329 and 338.

On *Cyanea sp.* Hawaii: Kealakekua, July 25, no. 1012.

On *Vaccinium reticulatum*. Oahu: Tantalus, June 22, no. 637.

On *Suttonia lessertiana*. Oahu: Palolo valley, June 10, nos. 339, 356.—Hawaii: Kealakekua, July 25, no. 980; Hualalai, July 19 (Chas. Judd) no. 903.

On *Alyxia olivaeformis.* Oahu: Palolo valley, June 10, no. 334.—Hawaii: Kapapala ranch, July 18, no. 888.

On *Piperomia sp.* Hawaii: Kealakekua, July 25, no. 1000.

On *Smilax sandwicensis.* Oahu: Wahiawa, June 3, no. 258; Olympus, June 24, nos. 687, 642, 643.—Maui: Iao valley, Sept. 7, no. 1154a.

On *Vincentia angustifolia.* Hawaii: Kilauea, July 11, no. 791.

On *Baumea meyenii,* Hawaii: Between Kilauea and Hilo, July 10, no. 784.

On grass. Hawaii: Kealakekua, July 25, no. 1010.

On *Elaphoglossum sp.* Oahu: Wahiawa, June 3, no. 250.



FIGURE 16.—*Trichopeltis reptans* (No. 1054): *a, b,* on Straussia sps. showing different stages of development of the ostiole; *c,* a still younger ostiole than the specimen shown in *a; d,* showing detail of cell arrangement, the central rows of cells parallel to the axis of the band, with other cells developing at right angles to the axis; *e,* showing a thallus band without lateral extension; *f,* showing shape and septation of ascospores.

Though growing on a great variety of hosts and showing much variation in vegetative form, there appears no sufficient reason for separating the species into varieties or distinguishing any of the varieties from *T. reptans.* The thallus is sometimes found to be composed of long, narrow lobes (See Pl. VIII, B, C, D, E, F) sometimes of lobes shorter, thicker and more rounded (See Pl. VIII, A), and again with the lobes so coalescing as to form a solid plate, often circular and 3-4 mm. in diameter (Pl. VIII, A, B, F). At times a pronounced central band is seen, running lengthwise of the thallus with marginal growths reaching at right angles on both sides, (fig. 16, *d*) closely resembling the published figures of *Trichopeltis pulchella* (196, vol. 15, p. 425 IC. fig. 3a).

In other stages of development the same fungus may be quite devoid of the lateral outgrowing hyphae (fig. 16, *e*). The lateral outgrowth just beginning on a band previously without them is shown in figure 17, *c.* A

whirled thallus type is shown in figure 17, *a*, leading to close resemblance to Brefeldiella as figured by Theissen. All of these thallus types show perithecia, asci, and spores indistinguishable in character. Occasionally a marked, abrupt change in type of thallus is seen, the component cells that were previously parallel and orderly becoming irregularly arranged (fig. 17, *d*). No antagonism of colony for colony, such as is so common among growing colonies of fungi, is seen and two neighboring colonies, or branches of colonies, continue to grow toward each other until they meet,

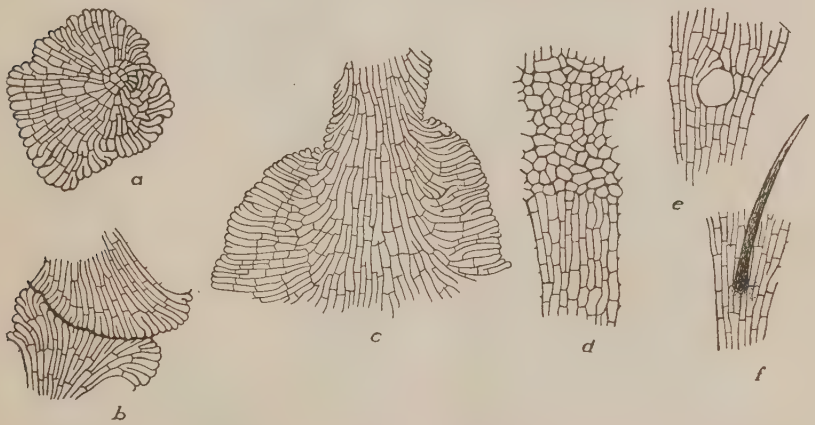


FIGURE 17.—*Trichopeltis reptans: a,* a circular thallus with no development of bands; *b,* (No. 637) on *Vaccinium reticulatum,* showing how lobes of two thalli react on contact with each other; *c,* showing (on specimen No. 1054) a simple band that is changing to the type with lateral development; *d,* (No. 1054) on Straussia sp.—a thallus in which the growth habit suddenly changed from the parallel, regular cell arrangement to an irregular arrangement; *e,* (No. 637) on *Vaccinium reticulatum,* showing how the thallus grows around a circular trichome; *f,* (No. 251) a thallus with the setum of another species of fungus growing through it.

their points of juncture being marked by a definite sharp line. (See fig. 17, *b*.) Thalli stripped from a leaf bearing smooth trichomes—from *Vaccinium reticulatum* for example— show holes marking the position of the trichomes, around which the advancing growth flowed as a stream around an island (fig. 17, *e*). Occasionally fungi of the genus Chaetothyrium, or near kin to it, growing with *T. reptans,* may send its setae through the thalli, making it appear as though the thalli of *T. reptans* bore the setae (fig. 17, *f*).

The perithecia are usually from 60-140 μ in diameter, though often smaller. The ostioles are roughly circular to elliptical and ragged of edge (fig. 16, *a, b*). The 8-spored asci are about 29-36 by 10-11 μ, with the

spores inordinate. The spores are about 11 by 3 μ, slightly larger at one end than at the other, and usually with one septum dividing the spore unequally, the septum being near the large end of the spore. Quite frequently, however, the spores are two-septate. (See fig. 16, *f*.) No paraphyses were seen.

On breaking open the perithecia, it is seen that the secondary thallus layer here present resembles the primary layer in all ways, except that it is



FIGURE 18.—*a, Enthallopycnidium gouldiae* (No. 1073*a*) on Gouldia sp.—thallus showing mode of cell arrangement; *b, Trichothallus hawaiiensis* (No. 492) on Scaevola, showing the general shape of thallus; *c,* showing the ragged irregular edge of the thallus.

hyaline and of somewhat less regular cell arrangement. The cells of the vegetative thallus vary somewhat in size and shape, but are usually rectangular and about 7-14 μ long, 3 μ wide (figs. 16, *a, b, c;* 17, *c*).

No. 123. **Trichopeltis rhyacoides** Stevens n. sp.

Ascopores 1-2 or 3-septate shorter and thicker than *T. reptans,* 7-8 × 3.5 or 5.5 × 3.5 μ, and often breaking apart at the primary septum, obtuse hyaline. Thallus bands long, spreading, narrow, usually no more than 45-60 μ wide. Cells commonly 18-25 μ long by 3 μ wide. Perithecia frequently wider than the thallus, causing it to broaden out. (See Pl. VIII, *G.*)

On *Alyxia olivaeformis.* Hawaii: Kealakekua, July 25, no. 985.

The specific name is derived from the Greek word *rhyax,* a lava flow, on account of the similarity of the thallus bands to flowing lava. This and the preceding are very distinct species in shape and size of spores and in septation as well as in character of the thallus.

61. ENTHALLOPYCNIDIUM Stevens n. gen.

Thallus that of the Trichopeltaceae. Pycnidia only known. Pycniospores 1-celled, linear, hyaline.

No. 124. **Enthallopycnidium gouldiae** Stevens n. sp.

Thalli 1-3 mm. in diameter, almost circular, consisting of a complex plate resulting from the coalescence of branch thalli; cells usually short (6 μ). Pycnidia small (40 μ) to large (90 μ). Ostiole as in Trichopeltis. Spores linear, hyaline, 1-celled, 7-7.5 by 1 μ. (See fig. 18, *a*.)

On *Gouldia sp.* Hawaii: Hamakua, upper ditch trail, July 31, no. 1073a.

In type of thallus, size of its cells, and in the possession of pycnidia only, does this differ from all others of the Trichopeltaceae. The conidia resemble those of *T. hydycaryae* Th. but the thallus does not agree with that species.

62. TRICHOTHALLUS Stevens n. gen.

Thallus of the Trichopeltaceae. No perithecia or pycnidia present. Thallus setose.

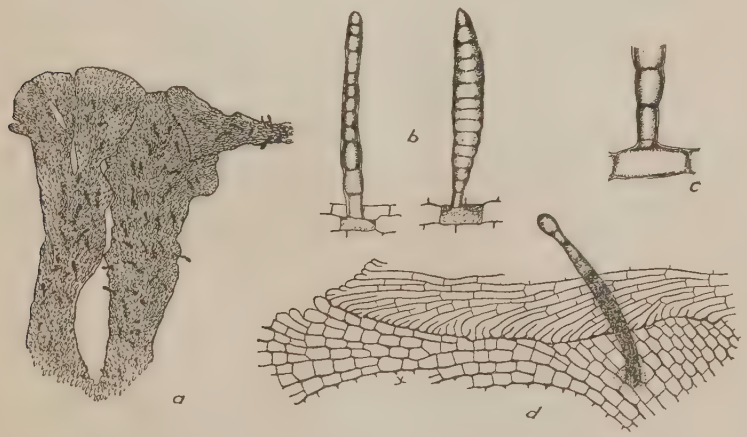


FIGURE 19.—*Trichothallus hawaiiensis: a,* (No. 1163) on Smilax, showiing the setae; *b,* (No. 492) on Scaevola, showing the dimorphism of setae; *c,* (No. 492) showing the mode of origin of a setum from the thallus cell; *d,* on Metrosideros, showing contrast between *Trichothallus hawaiiensis* (*Y*) and *Trichopeltis reptans* (*X*) in cell size, shape and arrangement.

No. 125. **Trichothallus hawaiiensis** Stevens n. sp.

Thallus strap-shaped, irregular, edges erose. Thallus cells about 10-11 μ long by 4.5-5.5 μ wide, rectangular, parallel, not diverging at right angles on the margins. Setae numerous, but distinct from each other, simple, consisting of many cells (about

9), 90-100 μ long by 7 μ wide, thickness greatest some distance above the base and the setum, tapering toward each end; apex obtuse; cells not constricted at the septa. Setae dimorphous; sometimes, though in a small percentage of cases, thicker (11 μ) and with more numerous cells (14) and with an acute apical cell. (See figs. 18 *b*—19, *a*—*d*.)

On *Straussia.* Maui: Iao valley, Sept. 7, no. 1054.

On *Scaevola sp.* Kauai: Kalalau trail, June 16, no. 492 (type). Hawaii: Kealakekua, July 25, no. 1012.

On *Pelea sp.* Maui: Olinda pipeline, Sept. 5, no. 1137. Hawaii: Kealakekua, July 25, no. 986a; also collected by Fullaway and Giffard in 1919.

On *Metrosideros polymorpha.* Hawaii: between Hilo and Kilauea, July 10, no. 777.

On *Phyllostegia floribunda.* Hawaii: Forbes-Stevens, no. 647, 1915.

On *Rubus hawaiiensis.* Hawaii: between Hilo and Kilauea, July 10, no. 773.

On *Broussaisia sp.* Hawaii: Kilauea, July 16, no. 862.

On Clermontia. Maui: Iao valley, Sept. 7, no. 1154a.

On *Alyxia olivaeformis.* Hawaii: Kealakekua, July 25, no. 985.

On Smilax, no. 1163.

On *Vincentia angustifolia.* Hawaii: Kealakekua, July 25, no. 1007.

On Sedge. Hawaii: Kealakekua, July 25, no. 998.

On Elaphoglossum. Oahu: Tantalus, June 22, no. 662.

On *Freycinetia arnotti.* Oahu: July 24, no. 674.

This fungus is distinguishable from all other Trichopeltaceae by its thallus alone, even without consideration of the setae. The setae make it remarkably different from all other fungi. It is probable, though not demonstrable, that the setae, particularly the large, thick forms, function as conidia or as chlamydospores, and that this efficient evolution has rendered unnecessary the pycnidia and perithecia.

This fungus is present in considerable abundance in the packet bearing the type of *Trichopeltis reptans* (see p. 80) and doubtless was seen by Theissen (195, p. 634), who, despite the striking dissimilarity between the forms of the thalli of these two species, regarded them as belonging to one species. The sterile, conidial thallus of this fungus was also noted by Spegazzini as is shown by his drawings.

HEMISPHAERIACEAE

Theis., Ann. Myc., vol. 11, p. 469, 1913

KEY TO HAWAIIAN SUB-FAMILIES OF HEMISPHAERIACEAE

- Perithecial covering pseudoparenchymatic
 - Asci covered **Thrausmatopeltineae**
 - Asci naked **Gymnopeltineae**

THRAUSMATOPELTINEAE

Theissen (194, vol. 11)

MICROTHYRIELLA

On the hibiscus in Hawaii there occurs, both upon young vigorous leaves and on old yellowed and dying leaves a fungus, which, owing to its general and microscopic resemblances to the so-called fly-speck of apples, may well be called the hibiscus fly-speck. This fungus was found to be very common in almost all localities where the host grew, though it varied greatly in abundance, sometimes being so prevalent as nearly to cover every leaf on the plant, while at other times only scattered colonies on a few leaves were seen. To the unaided eye the fungus appears merely as a number of small, black dots about a millimeter in diameter on the upper leaf surface. These dots are usually in roughly concentric arrangement, so that some seven or eight circles of dots give a group of perhaps a centimeter in diameter, (see Pl. IX, *E, F*), the whole group consisting of hundreds of dots; thus in a group 3 millimeters in diameter there were 80 fully developed specks and three times as many young ones.

Numbers of such groups on one leaf may by enlarging and coalescing lead to the occupation of the whole leaf surface by the groups, though the distance between dots was so great, averaging about 150 μ, that but small portion of the leaf surface was covered by the dots themselves. The general appearance of the groups suggests that each group originates from a central point and spreads radially, equally in every direction, on the plane of the leaf surface.

No deleterious effect of the fungus upon the leaf was observable. The fungus was frequently found covering a comparatively young, vigorous, green leaf with no signs of injury. It seemed more common on older leaves that had begun to turn yellow, but the apparent abundance may have been in reality due to the fact that the specks are more conspicuous on a yellow than on a green leaf. Then, too, the yellowed leaves, being older, had given longer time during which the fungus might develop.

The particular interest of the fungus lies not in its relation to any disease condition of the hibiscus, but in its striking resemblance to the apple flyspeck, the latter being a fungus which rarely produces spores and the true relationship of which is consequently uncertain. Microscopic examination of the Hawaiian hibiscus flyspeck shows the relation to apple flyspeck to be more than superficial, and since I was able to secure asci and spores from it, I present a complete description of the fungus here.

63. MICROTHYRIELLA v. Höhn.

Fragments zur Mykologie no. 6. Sitz. d. kais. Ak. d. wiss. Wien. Math.-nat. Kl. Ab. 1, vol. 118, p. 371, 1909

No. 126. **Microthyriella hibisci** Stevens n. sp.

Fungus epiphyllus. Perithecia numerous, roughly concentrically arranged, irregularly circular, usually 140-170 μ in diameter, with a distinct ostiole about 20 μ in diameter, which has a slightly dark border. Covering membrane brown, pseudoparenchymatous, composed of irregularly angular, mostly 5-sided cells, about 3-5 μ large. Edge irregular; center distinctly raised. Asci globular or ovate, 18-36 by 14-16 μ. Spores 11 by 2 μ, oblong, hyaline, obtuse, 1-septate with the septum near one end. See Pl. IX, *E, F, G;* fig. 20.)

On *Hibiscus* cult. Oahu: Beretania St., Honolulu, May 18, no. 5; Honolulu, June 2, nos. 189 and 193.

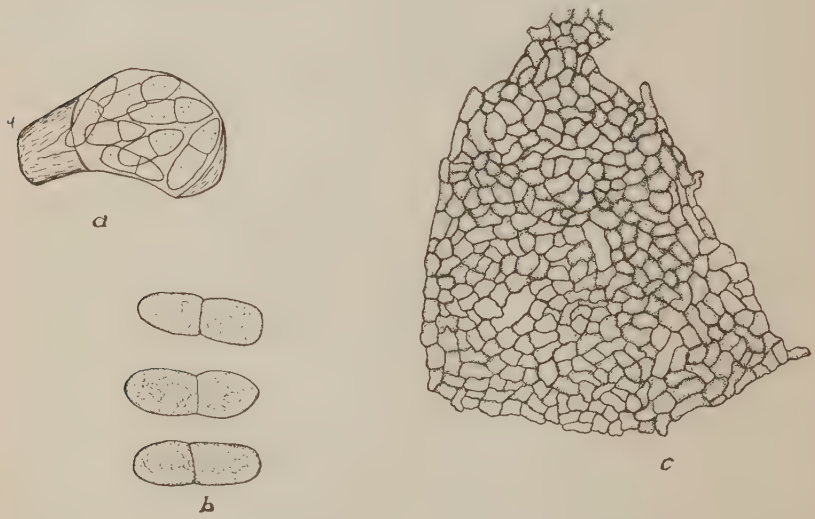


FIGURE 20.—*Microthyriella hibisci* (No. 100) on Hibiscus: *a*, an ascus; *b*, spores; *c*, perithecium showing the numerous ostioles.

Occasionally two or three primary ostioles may be in the same perithecium, perhaps due to the coalescence of two forming perithecia, while in old perithecia very numerous minute secondary ostioles, mere holes about 3 μ wide, develop apparently in the same manner that the primary ones developed. No reason for the concentric arrangement of perithecia was found. No surface mycelium whatever was seen, nor did microtome sections show any evidence of effects on the host tissue.

The systematic position of this fungus is not quite clear. It certainly belongs to the Hemisphaeriales and in this order to the Hemisphaeriaceae, sub-family Thrausmatopeltineae; except for its ostiole it agrees fully with the generic description of Microthyriella. Fifteen species are listed by Theissen (193, vol. 12, p. 93) as members of this genus, of which *M. rickii* (Rehm v. Höhn) is the type. This type species is described as being without an ostiole, the whole surface of the perithecium fragmenting and thus freeing the spores. The generic description also notes this character, which is also exhibited by several, though not by all of the species now placed in the genus. *M. hibisci* does possess an ostiole, but it shows also numerous secondary ostioles thus deviating somewhat from the useful perithecium with one well-developed ostiole.

GYMNOPELTINEAE

Stevens and Guba n. sub. fam.

Thallus that of the Thrausmatopeltineae, asci solitary, naked, without a covering membrane.

64. HEXAGONELLA Stevens and Guba n. gen.

Mycelium superficial, branched, forming a close, net-like, flat, round thallus. Asci 8-spored, thick walled, solitary in hexagonal cell meshes, not in perithecia. Paraphyses absent. Spores 3-celled, brown.

No. 127. **Hexagonella peleae** Stevens and Guba n. sp.

Fruiting thallus epiphyllous, dark brown. Asci solitary, scattered in hexagonal cell-meshes, 17 by 16 μ in diameter. Spores with thick walls, brown, 3-celled, 12 by 5 μ, ellipsoid or oblong, obtuse, the lowest cell the broadest and nearly spherical. (See Pl. IX, *H;* fig. 21.)

On *Pelea rotundifolia.* Oahu: Wahiawa, June 3, no. 248.

The peculiarities of the fruitinf thallus of this fungus raise many questions as to the disposition of the genus among the fungi. By a study of other groups, however, with characters in some ways similar to those of Hexagonella—namely, the families Ascocorticiaceae, Myriangiaceae, Saccardiaceae, and Hemisphaeriaceae—it appears probable that it is most closely related to the last named family, as the following discussion will show.

The fruiting thallus of Hexagonella is very small (Pl. IX, *H*), flat, cushion-like, superficial and free, with very slight cuticular connection with the host. The major part of the thallus consists of a disk composed of a layer of closely woven mycelium, which is differentiated into fertile and sterile cells (see 21, *a*). Surrounding the central disk is a somewhat irregular periphery of sparsely interwoven and loosely branched, spreading,

hyphae, which terminate somewhat loosely and irregularly. The asci are borne in a single layer and are not in perithecia, and are not covered, each ascus resting in a space between the sterile cells which present a mesh-like appearance. (See fig. 21.) The walls of the hexagonal cell meshes are quite thick and are formed of strands of hyphae. Each ascus contains 8 ascospores. The ascospores are 3-celled, and with thick walls (fig. 21, *c*).

The thallus of Hexagonella is dark brown. The asci are prominent due to the dark color of the spores. The periphery of the thallus and the loose hyphae spreading therefrom appear almost hyaline.

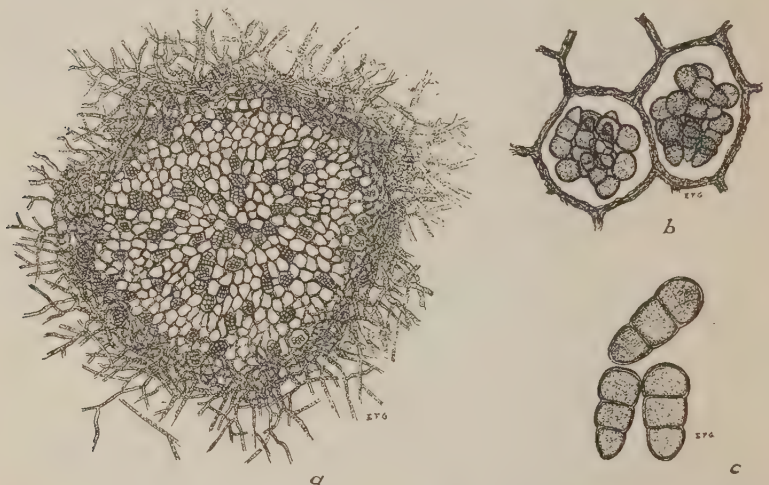


FIGURE 21.—*Hexagonella peleae* (No. 248) on Peleae: *a*, surface view of the fruiting thallus showing the solitary asci arranged irregularly among hexagonal cell meshes and the periphery of densely interwoven mycelium with loosely branching and spreading marginal hyphae; *b*, surface view of two ascus cavities showing naked and solitary asci, the mycelial character of the walls of the ascus cavities, and the arrangement and position of the ascospores; *c*, ascospores.

In the Ascocorticiaceae we have a suggestion of a possible relationship with Hexagonella in the flat, indefinite membranous thallus formed of floccose interwoven hyphae, bearing a compact layer of naked asci in a compact hymenium. Hexagonella, however, differs from the Ascocorticiaceae in that the asci are not arranged in a close, thick, erect palisade, but are solitary, and separated from each other by sterile hyphae.

In the sub-order Eumyriangieae of the Myriangiales the characters of the fruiting stroma are in some respects like the fruiting thallus of Hexagonella. This group is characterized by a cushion-like, erumpent stroma

bearing the asci solitary, but unstratified, in irregularly arranged cavities. The Myriangiaceae and the Saccardiaceae occur in this sub-order. In the Myriangiaceae the asci arise individually and at different depths. These form several layers throughout the stroma and become exposed through the progressive upward growth of the stroma and the wearing away of the uppermost layer. Haxagonella resembles the Myriangiaceae in that the asci in the cavities are solitary, but is quite distinct from them in possessing no stroma. In the Saccardiaceae the ascus cavities are solitary and in a single layer in a stroma. It is in this family that we have the closest analogy to Hexagonella in the Myriangiales, but, unlike this group, Hexagonella lacks the stroma characteristic of the Myriangiales, its ascus cavities being arranged in a single-layered thallus.

While the possession of naked and solitary asci is a striking feature of Hexagonella, the type of thallus is still more striking. This flat, thin, soft thallus shows no relationship whatever with any of the groups discussed above, and if it were considered without its asci, would find relationship only with the Hemisphaeriaceae. The thallus considered without its asci, indeed, agrees precisely with the Hemisphaeriaceae. In assigning this fungus to its position, therefore, I consider that this character is the one of greatest importance and accordingly place Hexagonella in this family.

Theissen and Sydow (196, vol. 15) record the Hemisphaeriaceae in three sub-families—namely, the Dictyopeltineae, characterized by a net-like, blue-green covering membrane; Thrausmatopeltineae with a brown, pseudo-parenchymatic membrane; and Plochmopeltineae with a meandering, plecty-matic covering membrane. Of these three sub-families, the one most nearly in agreement with Hexagonella in type of thallus is the Thrausma-topeltineae, yet the solitary naked asci present characters showing a very significant difference between Hexagonella and all members of the Thraus-matopeltineae. Recognizing, therefore, the kinship of Hexagonella with the Hemisphaeriaceae and its difference from the sub-families now in that family, I suggest for the reception of this genus the new sub-family Gymno-peltineaeae given above.

65. ANOMOTHALLUS Stevens n. gen.

Fungous body mainly consisting of cell plates, but partially of cell filaments. Asci borne in globular, setose perithecia. (See Pls. IX, *J* and *X, A-B, C.* fig. 22.)

No. 128. **Anomothallus erraticus** Stevens n. sp.

Thalli superficial, black, usually 1-5 mm. in diameter, very irregular in outline, scattered over the upper surface of the leaf, consisting of brown cells, some arranged in simple regular filaments, others in regular cell plates made of adjacent cell rows; as a rule the cells branch in very irregular manner and give rise to cell plates of complicated and irregular pattern. Perithecia globular, not radiate, borne on the

thalli, ostiolate, setose around the ostiole, 46-92 μ in diameter. Perithecial setae few, about 30 μ long, acute, black. Asci and spores not seen with certainty; spores probably 2-celled, dark, 11 by 3.5 μ.

On *Rubus hawaiiensis.* Maui: Olinda pipeline, Sept. 5, no. 1138; Pogue's ditch trail, Sept. 6, no. 1155.

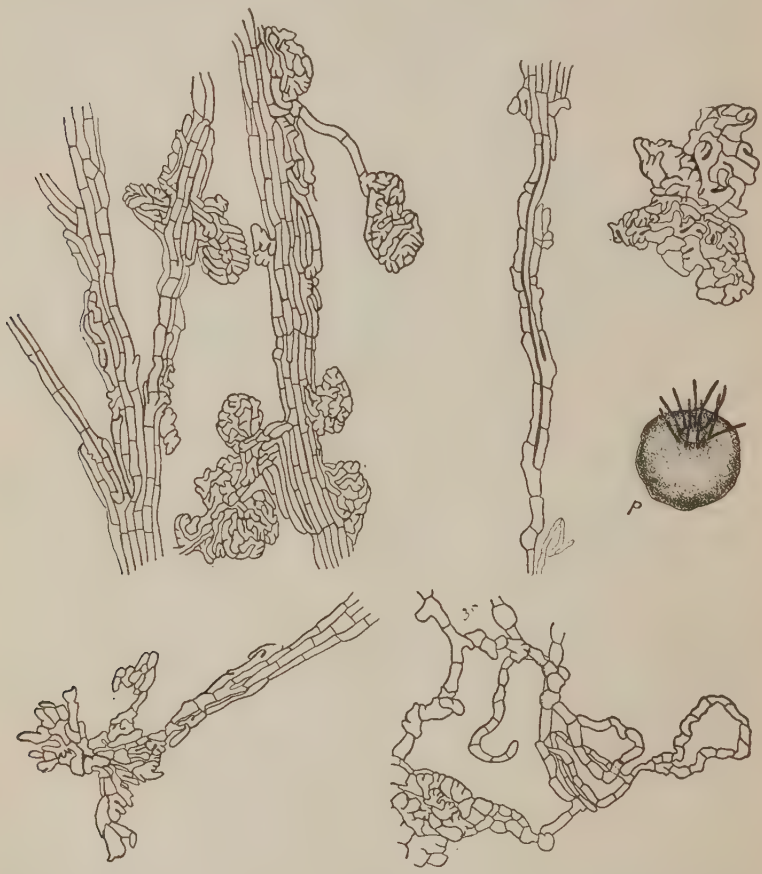


FIGURE 22.—*Anomothallus erraticus* (No. 1155) on Rubus, showing cell arrangements and a setose perithecium (*p*).

This very remarkable fungus was found only on the one species of Rubus, though other species of Rubus in the neighborhood of it were examined carefully. To the unaided eye, or even with aid of a hand lens, the spots somewhat resemble ordinary rose bronze or the rose black spot,

and it was not until a compound microscope was used that the presence of a fungus was made certain. On clearing the leaves, by boiling in weak potash or in alcohol, the black region is seen to consist of an intricately-formed thallus (See Pls. III, *F;* IX, *J;* and X,*A-C*). This thallus frequently consists of bands composed of more or less regular, parallel hyphae, while very rarely a filament consisting of a single row of cells was formed. (See fig. 22.) The major part of the thallus, however, was made up of cell plates, generally somewhat oval in outline, and about 30 by 45 μ in size, composed of very irregular cells. The name *erraticus* is given in view of the very erratic behavior of the cells, which sometimes form simple, straight hyphae of considerable length (as many as 14 straight, regular cells are sometimes found), sometimes bands of parallel regular cells, but which may suddenly change in character, resulting in most fantastic forms. The bands are found frequently radiating from a center (see Pl. X, *A*) and also often following along the smaller veins, though as a rule they refuse to cross them. (See Pl. IX, *J.*) Thus many thalli are limited to the areas between veins.

The relationship of this fungus is very uncertain. Regarding the thallus alone it appears to be kin to the Trichopeltaceae, or perhaps a transition form between them and the superficial filamentous brown fungi, but the perithecium has none of the characters of the perithecium of that group, and being spherical and setose, resembles the Perisporiales, except for the presence of an ostiole.

Hypocreales

KEY TO HAWAIIAN GENERA

Stroma filamentous, not fleshy **Hypomyceteae**
Stroma not filamentous
 Perithecium not immersed
 Conidiophores not stilbum-like
 With or without stroma **Nectrieae**
 Spores not filiform
 Spores 2-celled **Nectria**
 Spores 2 to many-celled **Gibberella**
 Spores filamentous **Ophionectria**
 Conidiophores stilbum-like **Sphaerostilbe**
 Perithecia immersed in a fleshy stroma, spores filamentous **Clavicipiteae**

HYPOMYCETEAE

66. **TORRUBIELLA** Boud. Rev. Myc. vol. 7, p. 221, 1885

No. 129. **Torrubiella sp.**

On *Omiodes accepta* (adult moth). Unpublished record by O. H. Swezey.

NECTRIEAE

67. **NECTRIA** Fries, Summa Veg. Scand., p. 387, 1849

No. 130. **Nectria subcoccinea** Sacc. and El.[8] Michelia, vol. 2, p. 570, 1882
Oahu: Waiahole ditch trail, June 12, no. 384.
It grows parasitic on scale insects.

No. 131. **Nectria subquaternata** Berk. and Br.[8] forma **farinosa,** in Jour. Linn. Soc., vol. 14, p. 116, 1875.
On Aleurites. Oahu: Tantalus, June 20, no. 585; Manoa valley May 24, no. 81.

No. 134. **Nectria sps.**
On *Saccharum officinarum* (cane). "Undetermined species reported saprophytic from Hawaii." Caum.

68. **GIBBERELLA** Sacc. Mich. vol. 1, p. 43, 1877

No. 133. **Gibberella lagerheimii** Rehm, Hedwigia, vol. 34, p. 163, 1895
On *Freycinetia arnotti.* Molokai: Oct. 21, 1913, L. D. Larson, Lyon no. 70.

No. 134. **Gibberella pulicaris** (Fries) Sacc. Michelia, vol. 1, p. 43, 1878
On dead fruit of *Solanum sp.* Kauai: Kalalau trail, June 16, no. 551.
Both the perithecial and the fusarial stage are present and agree with the descriptions.
(See fig. 23, *a.*)

69. **OPHIONECTRIA** Sacc. Michelia, vol. 1, p. 323, 1878

No. 135. **Ophionectria coccicola** (El. and Ev.) Berl. and Vogl in Add. I.-IV, Syll. Fung., p. 218, 1886.
On *Lepidosaphes beckii.* Hawaii: Hilo, 1912. Unpublished record by O. H. Swezey.

70. **SPHAEROSTILBE** Tul. Sel. Fung. Carp., vol. 1, p. 130, 1861

No. 136. **Sphaerostilbe coccophila** Tul. Sel. Fung. Carp., vol. 1, p. 130, 1861
On *Lepidosaphes beckii.* Collected by Lyon in 1916, also by C. W. Carpenter (29, Rep. 1919).

CLAVICIPITEAE

71. **CORDYCEPS** Fries, Syst. Myc., vol. 2, p. 323, 1823

No. 137. **Cordyceps** (sterile)
On *Perkinsiella saccharicida* and *Siphanta acuta.* Recorded by A. T. Speare (172).

[8] Determined by Sydow.

Sphaeriales

KEY TO HAWAIIAN GROUPS

Perithecium free and without stroma or superficial on a stroma
- Perithecium with circular ostiole ... **Sphaeriaceae**
 - Spores 1-celled ... 72 **Rosellinia**
 - Spores 3- to many-celled ... 73 **Melanomma**
- Perithecium not with circular ostiole ... **Lophiostomataceae**

Perithecia without stroma and immersed in the substratum, or immersed in a stroma.
- No stroma present
 - Perithecia neither prominently beaked nor clypeate
 - Paraphyses absent ... **Mycosphaerellaceae**
 - Spores 1-2 celled
 - Spores hyaline
 - Spores 1-celled
 - Spores allantoid
 - Perithecia minute sub-epidermal ... 75 **Massalongiella**
 - Perithecia very large and deeply sunken 76 **Lageniforma**
 - Spores not allantoid ... 77 **Guignardia**
 - Spores 2-celled ... 78 **Mycosphaerella**
 - Spores dark 2-celled ... 79 **Phaeosphaerella**
 - Spores several celled ... 80 **Sphaerulina**
 - Paraphyses present ... **Pleosporaceae**
 - Spores not muriform
 - Spores hyaline ... 81 **Metasphaeria**
 - Spores colored ... 82 **Leptosphaeria**
 - Spores muriform ... 83 **Pleospora**
 - Perithecia either prominently beaked or clypeate
 - Perithecia prominently beaked ... **Gnomoniaceae**
 - Spores 1-celled ... 84 **Glomerella**
 - Spores 2-celled ... 85 **Gnomonia**
 - Perithecia clypeate ... **Clypeosphaeriaceae**
- Stroma present
 - Stroma of fungus and host elements ... **Valsaceae**
 - Stroma of fungus elements
 - Spores small, bent ... **Diatrypaceae**
 - Spores otherwise
 - Conidia superficial ... **Xylariaceae**
 - Stromata crustose
 - Conidia at first covered ... 90 **Nummularia**
 - Conidia at first free
 - Stroma at first fleshy ... 91 **Ustulina**
 - Stroma not fleshy ... 92 **Hypoxylon**
 - Stromata stalked
 - Stromata branched ... 93 **Xylaria**
 - Stromata not branched ... 94 **Penzigia**

SPHAERIACEAE

72. ROSELLINIA de Not. Giorn. Bot. Ital., vol. 2, p. 34, 1847

No. 138. **Rosellinia citriformis** Stevens and Weedon n. sp.

Perithecia scattered, 0.5-1 mm. in diameter, globose, smooth, erumpent, black. Asci numerous, 8-spored, 126-144 by 14-18 μ; paraphyses linear. Spores monostichous, dark brown, lemon-shaped, 18-25 by 10-14 μ. (See fig. 23, *b*.)

On dead twig. Molokai: Oct. 20, 1913, L. D. Larsen, Lyon no. 75.

According to generic characters and the characters used in the keys, the perithecia in this genus are superficial. In the present species they are immersed and only become partially superficial by the wearing away of the overlying tissues. However, many species of Rosellinia are cited in the Sylloge Fungorum of Saccardo as being subepidermal or erumpent, and the present form is therefore referred to this genus.

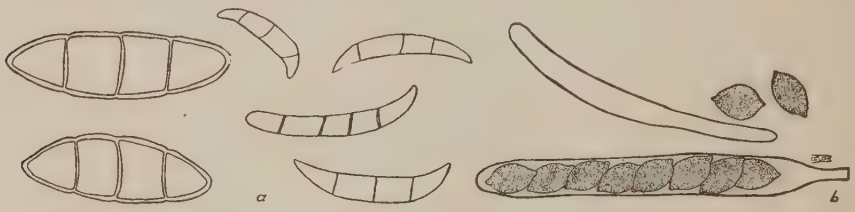


FIGURE 23.—*a, Gibberella pulicaris* (No. 551) on Solanum, showing ascospores and four conidia; *b, Rosellinia citriformis* (Lyon no. 75), asci and ascospores.

The typical lemon-shape of the spores is thoroughly characteristic of this species. Of the species of Rosellinia noted in the Sylloge Fungorum, there is only one in which the citrus-form of spore is mentioned, viz.: *R. groedensis*. However, the shape of the spores in that species greatly varies, being ellipsoid, fusiform, citriform or oval. Moreover, that species is recorded as growing on lichens. Other species agreed as to size and color of spores, but differed in that the perithecia were papillate and verrucose.

73. MELANOMMA Nitschke and Fuckel, Symb. Myc., p. 159, 1869

No. 139. **Melanomma clypeatum** (Sacc. & Pav.) Berk.

On *Freycinetia*. Lyon no. 87a. Determined by Rehm.

LOPHIOSTOMATACEAE

74. XENOLOPHIUM Syd. n. gen.[9]

Perithecia discreta, superficialia, atra, carbonacea, ostiolo compresso anguste rimoso; asci octospori, paraphysati, tenerrimi, tunica diffluente; sporae fusoideae, phaeodidymae.

[9] The description of this genus and the two species and also the discussion of them are by H. Sydow.

No. 140. **Xenolophium leve** Syd. n. sp.

Perithecia plus-minus dense distributa vel solitaria, atra, carbonacea, plerumque subostreiformia, circiter 1 mm. longa, ½-¾ mm. alta vel lata, levia, fragilia, ostiolo magno longo valde compresso acutiusculo. levi hysteriformi; asci tenerrimi, octospori, tunica facillime diffluente, parte sporifera 65-80 μ longa 10-13 μ lata; paraphyses copiosissimae, hyalinae, septatae, ramosae longissimae, circiter, 1 μ crassae; sporae distichae fusoideae, rectae vel leviter inaequilaterales, fuscae, medio septatae, semper distincte constrictae quaque cellula 1-2 guttulata, 18-23 μ longae, 4-5 μ latae, utroque apice appendicula minuta hyalina vel subhyalina auctae, loculis facile secedentibus. (See fig. 24, *a*.)

On dead bark of *Metrosideros*. Hawaii: Keauhou, Kona, Bishop Estate road, July 23, no. 953.

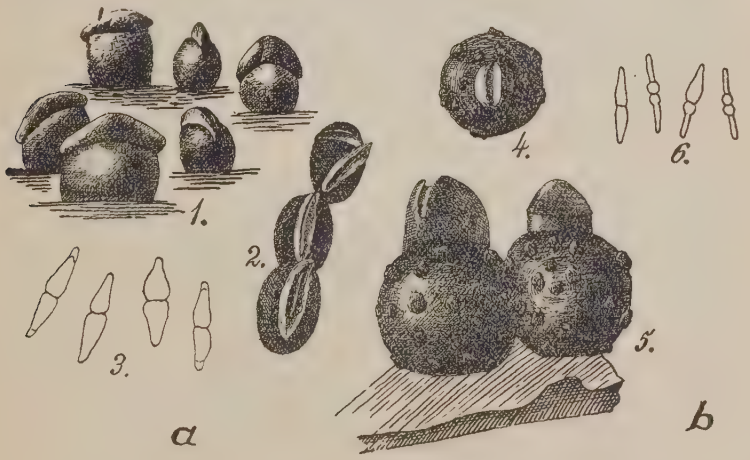


FIGURE 24.—*Xenolophium: a, X. leve*—six perithecia seen from different sides (1), three perithecia seen from above (2), and four spores (3); *b, X. verrucosum*—one perithecium seen from above (4), two perithecia in side view (5), and four spores (6).

No. 141. **Xenolophium verrucosum** Syd. n. sp.

Perithecia plus-minus dense distributa, sed semper discreta, atra, carbonacea, plerumque globosa vel ovato-globosa, 1½-2 mm. alta, 1¼-1½ mm. lata, ubique (ostiolo excepto) verrucis humilibus obsita, fragilia, ostiolo quam in praecedente breviori sed latiori parum compresso obtuso longitudinaliter tenuiter striato rima angustissima percurso; asci tenerrimi, octospori, tunica facillime diffluente, parte sporifera 65-70 μ longa, 10-13 μ lata; paraphyses copiosissimae, hyalinae, septatae, ramosae, longissimae, circiter 1 μ crassae; sporae distichae, fusoideae, rectae vel leniter inaequilaterales, fuscae, medio septatae, fere semper distincte constrictae, quaque cellula 1-2 guttulata, 17-21 μ longae, 3-4 μ latae, subinde uno vel utroque apice appendicula minuta subhyalina auctae, loculis facile secedentibus, plasmate subinde ad septum contracto et tunc sporae 4-cellulares evadunt ut in icone nostra depictate. (See fig. 24, *b*.)

On rotten wood (Metrosideros). Hawaii: Keauhou, Kona, Bishop estate road, July 23, no. 955.

In gross appearance the new genus at once indicates that we have to do with a member of the Lophiostomataceae, with a very curious one, however, for, although having made numerous microscopic slides of both species described, I was unable to find perfect asci. Large masses of spores are formed, and the eight spores of each ascus are well seen lying together as in the ascus, but the membrane of the asci could not be detected. The membrane must be a very delicate one, and must soon dissolve. I am inclined to think that the asci are at first short-pedicelled with spores densely crowded and measuring about 65-70 μ in length so far as the sporiferous part is considered. Later, however, they are considerably extended, reaching up to 100 μ in the sporiferous part.

The genus is readily separated by the characteristic behavior of the asci and the numerous much-branched paraphyses from other members of the family. Although both species described are quite similar under the microscope, yet they differ much in their external appearance. The perithecia of *X. leve* are for the most part not so high as they are long; they are entirely smooth, with a very long, smooth, and much compressed ostiolum. Those of *X. verrucosum*, however, are generally higher than long and with the exception of the ostiolum equally verrucose, the ostiolum is much shorter and only little compressed, hence considerably broader than in the former species, obtuse and distinctly longitudinally striate.

The crown of the left perithecium in our figure 24, 5 has been drawn somewhat too large, while that of the right perithecium is correctly drawn.

MYCOSPHAERELLACEAE

75. MASSALONGIELLA Speg. Anal. Soc. Ci. Argent., vol. 9, p. 180, 1880

No. 142. **Massalongiella canavaliae** Stevens and Young n. sp.

Perithecia black, scattered, 120-200 μ in diameter. Asci fasciculate, clavate, ends slightly thickened, 45-55 by 9-11 μ. Spores 1-celled, hyaline, granular, oval, 10-16 by 5-7 μ. Paraphyses absent.

On dead stems of *Canavalia sp.* Oahu: Honolulu, April 16, 1913. Lyon no. 312.

76. LAGENIFORMA O. A. Plunkett n. gen.[10]

Perithecia sunken deeply within the host, opening to the outside by a long rostrum, globose, or flattened at the bottom, black; asci 8-spored, spores allantoid, hyaline, 1-celled. No paraphyses.

[10] Description and discussion are by O. A. Plunkett.

No. 143. **Lageniforma bambusae** Plunkett n. sp.

Perithecia without a stroma, borne singly or in groups of two or three, sunken in the host tissue and connecting to the outside by a long rostrum, globose or usually slightly flattened at the bottom, black, coriaceous, ostiole protruding, 320-420 by 560-670 μ, perithecial wall 20-25 thick; asci thin-walled, minute, clavate, stalked, 8-spored, 18-20 by 4-5 μ; spores allantoid, hyaline, 1-celled, 4-5 by 1 μ. (See figs. 25, 26, *a*.)

Saprophytic on stems of Bambusa. Kauai: Kalalau trail, June 21, no. 489.

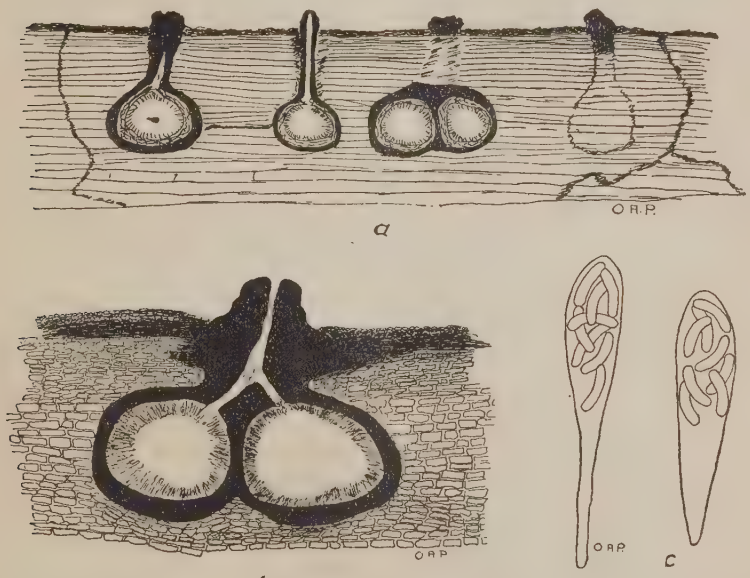


FIGURE 25.—*Lageniforma bambusae* on Bambusa: *a*, diagrammatic section of bamboo showing formation of perithecia deep within the host tissue, with a long rostrum reaching to the surface, an indistinct clypeate covering, and dark lines bounding the affected region; *b*, section of two perithecia having a common rostrum, showing the thick perithecial wall and the large hymenial region; *c*, asci.

On dead canes of bamboo the fungus described above gives the surface a blackened and roughened appearance due to the protruding beaks. In cross section the large perithecial cavities are quite easily seen with the naked eye. In section, under the microscope, there is no evidence of a stroma or stromatic layer. There is, however, a dense mass of black mycelium filling several layers of cells near the surface. This layer is continuous between the protruding ostioles connecting them with each other.

In some cases this mycelium leaves the surface layer and wanders deeper into the cortex, forming a black line, as may be seen from the diagrammatic drawing Figure 25, *a*. This black line is usually quite narrow and unbranched, although it may sometimes branch and wander. In rare instances the mycelium wanders for short distances away from the perithecial wall into the host cells, but in this case it never forms a black line. There is often formed above the perithecia a blackened area resembling a clypeus. (See fig. 25, *b*.)

The perithecia are peculiar in that they are situated at practically the same level, deep within the host tissue. Sometimes they are grouped together in twos or threes (fig. 25, *b*) without evidence of a stroma connecting them. It has been observed that when two perithecia lie side by side they usually have a common rostrum and ostiole. The development of the perithecium is worthy of some note since it proceeds from the top downward. The protruding rostrum is formed first, followed by a downward growth of the mycelium forming the outline of the perithecial wall and rostrum. (See fig. 25, *a*.) The host cells within these boundaries are then dissolved away during the development of the perithecium.

The stalked asci are borne on a prominent lining which occupies the entire perithecial wall (fig. 25, *b*.) These minute hyaline asci have very thin walls which might easily be overlooked and the fungus taken as at a conidial stage.

The presence of the globose, distinct walled perithecium and the absence of any superficial mycelium indicates that the fungus belongs to the Sphaeriales. The absence of a distinct stroma, the sunken perithecia and the fasciculate asci place it in the Mycosphaerellaceae, since the clypeus-like structure over the perithecia is not constant and distinct enough to be called a true clypeus. The greatest objection to placing the fungus in this family is the thickness of the perithecial wall. The Mycosphaerellaceae are characterized by having thin-walled perithecia. The walls in this genus, while quite thick, do not appear to be thicker than those of Guignardia and other genera of this family. The fungus has a number of characters in common with several genera of this family, but cannot be said to belong to, or have a close affinity with any of them. In the key to the genera of the family Mycosphaerellaceae in Engler and Prantl's Natürlichen Pflanzenfamilien, this new genus would be placed between Massalongiella and Guignardia. It differs from Massalongiella by having the perithecia borne deep within the host, instead of under the epidermis, by having a rostrum, and clavate, instead of cylindric asci. It differs from Guignardia in having a rostrum and allantoid spores.

On account of the resemblance of many of the perithecia to Florence flasks, I have called this new genus Lageniforma.

77. GUIGNARDIA Viala and Ravaz, Bull. Soc. Myc. France, p. 63, 1892

No. 144. **Guignardia alyxiae** Stevens n. sp.

Spot white, irregular, 2-7 mm. in diameter, border narrow, distinct, raised, purple. Perithecia black, 138-170 μ in diameter, epiphyllous, immersed, ostioles distinct. Asci 8-spored, 65 by 14 μ, strongly thickened at the apex. No paraphyses. Spores 1-septate, hyaline, long, cylindrical, not constricted, 22-25 by 4 μ. obtuse. (See fig. 26, *b*.)

On *Alyxia olivaeformis*. Oahu: Wahiawa, June 3, no. 199; Palolo valley, June 10, no. 308.

No. 145. **Guignardia jussiaeae** Stevens n. sp.

Spots circular, small, 1-2 mm., center dead, brown, border purple, definite. Perithecia few, globular, immersed, ostiolate, 90-125 μ in diameter. Spores oblong, obtuse, 1-celled, hyaline, 14 by 5 μ.

On *Jussiaea villosa*. Oahu: Tantalus, Sept. 5, 1909, Lyon no. 86.

No. 146. **Guignardia musae** Stevens n. sp.

Spot occupying large marginal areas of the leaf, blanched. Mycelium coarse, black. Perithecia densely black, 107-140 μ, ostiolate. Asci 47 by 11 μ, thin-walled, 8-spored. Spores hyaline, 1-celled, obtuse, 11 by 4 μ.

On *Musa* (banana). Oahu: Hakipuu, June 19, no. 565.

78. MYCOSPHAERELLA Johans. Oefv. K. Vet.-Akad. Förh., vol. 41, p. 163, 1884

No. 147. **Mycosphaerella artocarpi** Stevens and Young n. sp.

No definite spots produced. Fertile areas amphigenous, sooty or gray, 1-4 mm. in diameter, with indefinite margins. Perithecia minute, globose, 35-75 μ in diameter; ostiole distinct. Asci clavate or irregular, 18-33 by 7-9 μ. Spores 1-septate, hyaline, 9-11 by 3-4 μ.

On living leaves of *Artocarpus incisa*. Oahu: Hakipuu, Mr. Albert F. Judd's garden, June 19, nos. 579*c* and 566.

This fungus is a saprophyte, found in the gray areas of spots killed by *Phyllosticta artocarpi*.

No. 148. **Mycosphaerella cyaneae** Stevens and Young n. sp.

Very numerous, minute, black perithecia; densely gregarious, forming circular or irregular fused spots, 2-10 mm. in diameter, or covering most of leaf; margin indefinite. Perithecia mostly hypophyllous, 50-90 μ in diameter, ostiole distinct. Asci clavate or elongate, with acute apex, 25-36 by 3-6 μ. Spores fusiform, 1-septate, 10-13 by 2-3 μ.

On leaves of *Cyanea angustifolia*. Oahu: Honolulu, May 23, no. 723.

No. 149. **Mycosphaerella dianellae** Stevens and Weedon n. sp.

Spots elliptical, 1-2 cm. long, centers ashen-white, bordered by a reddish-brown band about 1 mm. wide; border definite. Spot characters visible from both sides of the leaf. Perithecia, numerous, erumpent, epiphyllous, circular or oblong, black, ostiolate, 140 by 155 to 230 by 310 μ. Asci about 50 by 11 μ, thick walled in the upper portion. Spores hyaline, 1-septate, oblong, obtuse, 12-14 by 3 μ. (See Pl. x, *E;* fig. 26, *c, d, e.*)

On *Dianella odorata.* Oahu: Wahiawa, June 3, no. 253; Waiahole ditch trail, June 12, no. 405; Kauai: Waimea canyon, June 15, no. 421 (type); Kalalau trail, June 16, no. 528; Maui: 1920, Forbes no. 1999.



FIGURE 26.—Ascospores and asci: *a,* ascospores of *Lageniforma bambusae* on bamboo; *b,* of *Guignardia alyxiae* (No. 199) on *Alyxia olivaeformis; c-e,* ascospores and asci of *Mycosphaerella dianellae* on *Dianella odorata—c,* a single ascus; *d,* a group of asci; *e,* four ascospores.

No. 150. **Mycosphaerella eugeniae** Rehm, Hedwigia, vol. 44, p. 4, 1905

On living leaves of *Eugenia sandwicensis.* Oahu: Palolo valley and Mt. Olympus, June 10, no. 321; Tantalus, June 22, no. 658.

On *Eugenia sps.* Molokai: Halawa, Aug. 1912, Forbes no. 477.

The characteristics of this specimen differed slightly from the description in that the center of the spot was white; the asci and spores larger, and the spores were cylindrical rather than fusiform. The spores from specimen Forbes no. 477 were wider than those of the printed description. In the light of these differences, it is possible that the fungus on the above specimens represents a new species.

No. 151. **Mycosphaerella freycinetiae** Stevens n. sp.

Spots irregularly elliptical, visible from both sides of the leaf, tan colored, dead. Margins definite. Centers thickly studded with perithecia which are black, ostiolate, 150-200 μ in diameter. Asci numerous, 8-spored, 65-80 by 18 μ, thickened strongly at apex. No paraphyses. Spores inordinate, hyaline, 1-septate, 18-21 by 3:5 μ, cylindrical, straight, obtuse, not constricted. (See fig. 27, *a*.)

On *Freycinetia arnotti*. Oahu: Kalihi valley, Dec. 1908, Forbes no. 3.

No. 152. **Mycosphaerella hawaiiensis** Stevens and Young n. sp.

Spots none, or consisting only of slightly lighter areas. Perithecia numerous, hyphophyllous, scattered, 150-225 μ in diameter; ostiole distinct. Asci short, oval to somewhat clavate, 30-37 by 10-14 μ. Spores oval to fusiform, 2-celled, 12-16 by 2-3½ μ.

On living leaves of *Gunnera petaloidea*. Maui: Olinda pipeline, Sept. 5, no. 1143b.

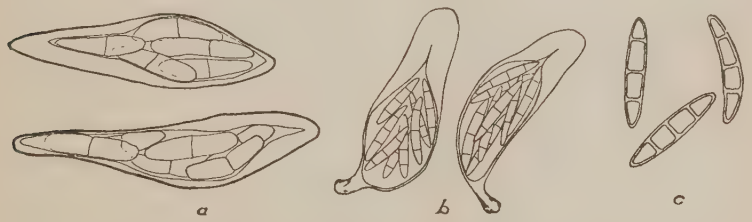


FIGURE 27.—Asci and spores: *a*, of *Mycosphaerella freycinetiae* (Fŏrbes no. 3) on *Freycinetia arnotti*; *b*, of *Sphaerulina cibotii* (No. 545); on *Cibotium menziesii*; *c*, spores.

This fungus differs from *Sphaerella gunnerae* Speg. in which species the perithecia are epiphyllous and the spores are only 8-9 μ long.

No. 153. **Mycosphaerella hedychii** Stevens and Young n. sp.

Spots large, brown, 3-10 cm. in diameter, margin brown, indistinct. Perithecia minute, scattered, black, globose, 65-90 μ in diameter, ostiole distinct. Asci 25-35 by 5-8 μ, clavate. Spores 1-septate, hyaline, sometimes tapering towards one end, 8-11 by 2 μ.

On living leaves of *Hedychium coronarium*. Hawaii: Wailuku river, July 8, no. 744.

No. 154. **Mycosphaerella kaduae** Stevens and Young n. sp.

Spots several on each leaf, circular or somewhat irregular, center white or brown, 1-10 mm. in diameter, margin black, sharply raised. Perithecia several in each spot, epiphyllous, black, shining, globose, 90-250 μ in diameter, ostiole large. Asci clavate, thickened at tip, 60-80 by 15-20 μ. Spores hyaline, 1-septate, 20-25 by 2-3 μ.

On living leaves of *Kadua sp.* Oahu: Konahuanui, no. 112. Collected by Bergman.

On *Kadua grandis.* Oahu: Tantalus, May 25, no. 93.

On living leaves of *Gouldia sp.* Oahu: Tantalus, June 22, no. 602.

The spots of this fungus are identical in character with those of *Septoria gouldiae,* and it is probable that these forms are connected.

No. 155. **Mycosphaerella metrosideri** Stevens and Young n. sp.

Spots circular, 2-4 mm. in diameter, center white, margin raised, brown to black, surrounded by a brown, discolored area. Perithecia epiphyllous, 45-100 μ, immersed; ostiole distinct. Asci clavate, sometimes irregular and curved, 40-55 μ by 18 μ. Spores hyaline, 1-septate, 20-25 μ by 3-6 μ, tapering towards one end.

On living leaves of *Metrosideros polymorpha.* Oahu: Wahiawa, May 31, no. 159; Kalihi valley, June 2, no. 183; Olympus, June 24, no. 716; Hawaii: Kohala, July 2, 1919, Lyon no. 481.

No. 156. **Mycosphaerella rosigena** (El. and Ev.)

Sphaerella rosigena El. & Ev. Jour. Myc., vol. 3, p. 45, 1887

On *Rosa sp.* (cult.). Hawaii: Kealakekua, July 23, nos. 931 and 932; Waimea, July 27, no. 1025.

In these collections the asci were thin walled, 4-spored, 22 by 7 μ; spores hyaline, 1-celled, cylyindrical and slightly curved, obtuse, 14-18 by 2 μ.

No. 157. **Mycosphaerella scaevolae** Stevens and Young n. sp.

Spots brownish-white, 2-5 mm. in diameter, circular or slightly irregular, margin distinct and slightly raised, or indistinct. Perithecia black, amphigenous, 35-115 μ in diameter, ostiole definite. Asci clavate, 30-90 by 10-15 μ. Ascospores granular, two-celled, 10-20 by 3-5 μ, oval, slightly tapering at one end.

On living leaves of *Scaevola chamissoniana.* Oahu: Tantalus, June 22, no. 660 (type), also no. 614; Olympus, June 24, nos. 707, 722, 724, and 700; Kauai: Kalalau trail, June 16, no. 522.

On *Scaevola mollis.* Oahu: Wahiawa, June 3, no. 215; Konahuanui, November 3, 1912, Lyon no. 166; Tantalus, June 22, nos. 615, 646.

On *Scaevola glabra.* Oahu: Wahiawa, June 2, no. 204.

A Phyllosticta, which may be a pycnidial form of the Mycosphaerella, was found in scant quantity associated with it. Pycnidia 75-100 μ in diameter, ostiolate. Conidia 2-3.5 by 1.5-2 μ. It is therefore distinct from *Phyllosticta scaevolae* E. & E., the conidia of which are 10-12 by 2.5-3 μ.

Perithecia with asci were observed only on specimen no. 660, but the leaf spots and fruiting bodies on the leaves of the other collections listed appear to be identical with those on the type specimen.

No. 158. **Mycosphaerella striatiformans** Cobb

"On dead cane leaves in Hawaii." Caum.

79. PHAEOSPHAERELLA Karst. Symb. Myc. Fenn., vol. 26, p. 28.

No. 159. **Phaeosphaerella dianellae** Stevens n. sp.

Spots the same as those of *Mycosphaerella dianellae*. Perithecia small, 30-60 μ, black, ostiolate, erumpent, hypophyllous. Asci 65-72 by 14 μ, thin-walled, 8-spored. No paraphyses. Spores inordinate, 1, or rarely 2-3-septate, brown, obtuse, 14-18 by 3.5 μ, slightly constricted.

On *Dianella odorata*. Oahu: Wahiawa, June 3, no. 253; Waiahole ditch trail, June 12, no. 405; Kauai: Waimea canyon, June 15, no. 421 (type); Kalalau trail, June 16, no. 528; Maui: 1920, Forbes no. 1999.

No. 160. **Phaeosphaerella mangiferae** Stevens and Weedon n. sp.

Spots definite, bordered by a dark line, irregular, beginning at the edge of the leaf and extending to the midrib, or at the apex and extending toward the base; visible from both sides of leaf, underside tan to brown, upper side gray to brown; older regions thickly studded with perithecia which are sub-epidermal, brown, 140-230 μ in diameter, ostiole 10 μ in diameter. Asci numerous, 8-spored, 61-82 by 12-21 μ, thick-walled, aparaphysate. Spores light brown, 2-3 celled, not constricted, 18-21 μ by 7 μ, cylindrical, obtuse.

On *Mangifera indica* (mango). Oahu: Hakipuu, June 19, no. 583.

No. 161. **Phaeosphaerella hawaiiensis** Stevens and McMunn n. sp.

Perithecia solitary on stem, slightly raised, rounded, black, 300-336 μ. Asci numerous, 8-spored, 89-109 by 9-11 μ, straight to slightly curved, apex rounded. Base somewhat tapering. Spores uniseriate or slightly overlapping. Paraphyses none. Spores 1-septate, 12-18 by 9-11 μ, ellipsoid, light brown.

On unknown dicotyledonous host. Hawaii: Waimea, July 30, no. 1040.

P. hawaiiensis differs from *P. maculosa* in color, size and arrangement of spores, also materially from all others described in Saccardo's Sylloge Fungorum.

80. SPHAERULINA Sacc. Michelia, vol. 1, p. 399, 1878

No. 162. **Sphaerulina cibotii** Stevens and Guba n. sp.

Spots yellowish brown, mottled with black, indefinite and irregular. Perithecia epiphyllous, small, sphaerical, black, 90 μ in diameter. Asci fascicled, hyaline, 8-spored, sub-cylindric to ovate, thickened at the apex; 43 by 16 μ, with prominent pedicels. Asci opening by a longitudinal pore in the thickened apex. Spores 4-celled, hyaline, elongate to ovoid-oblong or fusiform, 15 μ by 3-5 μ. (See fig. 27, *b*.)

On the pinnae of *Cibotium menziesii*. Kauai: Waimea, June 17, no. 545; Hawaii: Kealakekua, July 25, no. 1003.

No. 163. **Sphaerulina ipomoeae** Stevens n. sp.

Perithecia immersed, globose, dark, 70-80 μ in diameter, ostiole dark bordered. Asci 8-spored, oblong, 43 by 14-18 μ. Spores hyaline, inordinate, 1-3 septate, 18-20 by 4 μ; no paraphyses.

On *Ipomoea bona-nox* (moonflower). Hawaii: Kealakekua, July 21, no. 908.

Associated with a Colletotrichum and *Ramularia ipomoeae* (see p. 150.)

PLOEOSPORACEAE

81. METASPHAERIA Sacc. Syll. Fung., vol. 2, p. 156, 1883

No. 164. **Metasphaeria cumana** (Sacc. and Speg.) Sacc. Syll. Fung., vol. 2, p. 177, 1883

Leptosphaeria cumana Sacc. and Speg. Michelia, vol. 1, p. 394, 1878.

On dead parts of leaves of Sedge. Kauai: upper Waimea canyon, June 15, no. 467.

No. 165. **Metasphaeria hawaiiensis** Stevens and Young n. sp.

Spots numerous, irregular, brown or white, 1-8 mm. in diameter or by confluence forming larger spots, margin raised, red or black. Perithecia epiphyllous, not numerous, 110-190 μ in diameter. Ostiole distinct. Asci 75-90 μ by 12-15 μ, slightly clavate; paraphyses filiform. Spores hyaline, 3-septate, 16-25 μ by 2.5-4 μ, constriction deep at the middle septum, less at the other two, ends rounded.

On living leaves of *Metrosideros polymorpha*. Hawaii: Kilauea, July 13, no. 826.

82. LEPTOSPHAERIA Ces. et De. Not. Comm. Soc. Crit. Ital., vol. 1, p. 60, 1863

No. 166. **Leptosphaeria dracaenae** S. Cam. in J. V. D'Almeida. Contrib. à la Mycoflore du Portugal, p. 26, 1903

On *Dracaena aurea*. Kauai: pipe trail, upper Waimea canyon, June 15, no. 419a.

This species agrees closely with the description of the above-named species in all respects except that spores are commonly 3-septate, rarely 4-septate. The perithecia are closely associated on the same spots with the pycnidia of *Coniothyrium dracaenae* (see p. 135), and are probably genetically connected.

No. 167. **Leptosphaeria proteispora** Speg. Anal. Mus. Nac. Buenos Aires, p. 282, 1889

On stems and more sparingly on leaves of *Paspalum conjugatum*. Hawaii: Kapapala Ranch, July 18, no. 886.

No. 168. **Leptosphaeria sacchari** v. Breda, Rood Rot., vol. 2, p. 25, 1892

On *Saccharum officinarum* (cane). Kauai: Lihue, L. D. Larson, 1912. "Attacks cane leaves in Hawaii."—Caum.

No. 169. **Leptosphaeria sp.**

"Parasitic on cane leaves in Hawaii. Apparently a new species on this host."—Caum.

83. PLEOSPORA Rab. in Herb. Mycal. Edit. 2, n. 547

No. 170. **Pleospora scaevolae** Stevens and Young n. sp.

Perithecia 170 μ in diameter, in center of mesophyll. Asci 45-70 by 9-12 μ. Spores 10-16 by 7-8 μ with 3-4 cross and 1-3 vertical septa. Paraphyses numerous.

On living leaves of *Scaevola chamissoniana*. Oahu: Tantalus, June 22, no. 660.

GNOMONIACEAE

84. GLOMERELLA Schrenk and Spauld. Science, new ser., vol. 17, p. 750, 1903

No. 171. **Glomerella cingulata** (Atk.) Schrenk and Spauld.

Gloeosporium cingulatum. Atk. Cornell Univ. Agr. Exp. Sta. Bull. 49, 1892

On *Mangifera indica* (mango). C. W. Carpenter (29, Rep. 1918).
On *Persea gratissima* (avocado). C. W. Carpenter (29, Rep. 1918).

No. 172. **Glomerella gossypii** Edgerton, Mycologia, vol. 1, p. 119, 1909

On *Gossypium* eult (cotton). C. W. Carpenter (29, Rep. 1918).

85. GNOMONIA Ces. and De. Not. Comm. Soc. Crit. Ital., p. 57, 1863

No. 173. **Gnomonia iliau** Lyon, H.S.P.A. Exp. Sta. Bull. no. 11, p. 28, 1912

On cane, "A sheath parasite, endemic to Hawaii and known for many years."—Caum.

CLYPEOSPHAERIACEAE

86. CLYPEOSPHAERIA Fuckel, Symb. Myc., p. 117, 1869

No. 174. **Clypeosphaeria stevensii** Syd. n. sp.[11]

Perithecia sparsa vel plus-minus dense distributa, quod magnitudimem variabilia, juniora 300-400 μ diam., matura 500-800 μ diam., applanata, clypeo epidermali aterrimo stromatiformi valde evoluto tecta, solitaria vel haud raro 2-3 sub clypeo communi sita, pariete coriaceo-carnosa, ostiolo pertusa. Asci cylindracei, obtusi, crasse pedicellati, 90-110 μ longi, 10-13 μ lati, octospori. Sporae recte vel oblique monostichae, anguste ellipsoideae vel oblongae, 3-septatae, non constrictae, 4-guttulatae, fuscidulae,

[11] H. Sydow.

20-25 μ longae, 8-10 μ latae. Paraphyses copiosissimae, distinctae, ascos multo superantes, filiformes, hyalinae, 1 μ crassae.

Ad caules Freycinetiae.

Hawaii: Keauhou, Kona, Bishop Estate road, July 25, no. 992.

VALSACEAE

87. DIAPORTHE Nitschke, Pyr. Germ., p. 240, 1870

No. 175. **Diaporthe phaseolarum** Cook and El. Grevillea, vol. 6, p. 93, 1878

On Bean. Oahu: Wahiawa, C. W. Carpenter, 1918, no. 242.

88. LYONELLA Syd. n. gen.[11a]

Stroma nullum. Perithecia innato-erumpentia, tandem saepe fere superficialia, primitus clausa, in maturitate irregulariter disrumpentia, in sicco profunde patelliformiter collapsa, membranaceo-coriacea, grosse parenchymatice contexta. Asci fusiformes, 4-spori, haud paraphysati. Sporae cylindraceo-allantoideae, continuae, hyalinae.

No. 176. **Lyonella neurophila** Syd. n. sp.

Perithecia praecipue in petiolis et in nervis primariis evoluta, plus-minus dense distributa, maculis nullis, mox erumpentia tandemque fere supeficialia, 250-300 μ diam., atra, primitus clausa, in maturitate irregulariter disrumpentia, in sicco profunde collapsa, contextu membranaceo-coriaceo, atro-olivaceo, cellulis 14-18 μ diam. Asci fusoidei, membrana tenuissima praediti, 4-spori, parte sporifera 20-22 μ longa, 9-10 μ lata; paraphyses nullae. Sporae subparallelae, cylindraceae, plus-minus allantoideae, continuae, hyalinae, 16-16 μ longae, 1½-2 μ crassae.

Ad folia emortua vel subemortua Straussiae.

Hawaii: Keauhou, Kona, Bishop Estate road, July 23, no. 971.

Without stroma. Perithecia developed especially on the petioles and the main ribs of the leaves, less numerous on the leaf blade, amphigenous, more or less densely distributed without discoloring the host, soon erumpent and at last nearly superficial, at first closed, at maturity probably irregularly broken off, and when dry deeply patellate, black, about 250-300 μ large. Context membranaceous-coriaceous, black-olivaceous, of large cells measuring 14-18 μ in diameter. Asci fusiform with a very delicate, evanescent membrane, without paraphyses, containing four spores only. Spores nearly parallel, cylindrical, more or less allantoid, one-celled, hyaline, 13-16 μ long, 1½-2 μ thick.

I place this genus among the Diaportheae, although it bears some resemblance to the Valseae. It might perhaps best be considered to take an intermediate position between these two families. Von Höhnel (89, p. 631) has published a system of the Diaportheae and Valseae, but there is no genus given that might be adapted to our fungus.

I dedicate the new genus to Harold Lloyd Lyon, the well-known pathologist of the Experiment Station of the Hawaiian Sugar Planters' Associa-

[11a] By H. Sydow.

tion, who has rendered valuable service regarding the fungus exploration of the Hawaiian Islands.

DIATRYPACEAE

89. DIATRYPE Fries p.p. Nitsche, Pyr. Germ., p. 64, 1867

No. 177. **Diatrype princeps** Penz. and Sacc.,[12] Malpighia, vol. 11, p. 501, 1897

On *Metrosideros polymorpha.* Oahu: Castle trail, Lyon no. 164. 1912: Palolo, Lyon 89, 1909; Maui: Kailau, Lyon no. 30. 1908: In Atkinson's list as determined by Rehm; Wahiawa, June 3, no. 237. Forbes no. 594. Collected by Albert Judd, June 21; Olympus, June 24, no. 725. Hawaii: Keauhou, Kona, Bishop Estate road, July 25.

XYLARIACEAE

90. NUMMULARIA Tul. Sel. Fung. Carp., vol. 2, p. 42, 1863

No. 178. **Nummularia guaranitica** Speg. Anal. Soc. Ci. Argent., vol. 16, p. 77, 1883.

On *Acacia koa.* Maui: Kailua, 1908, Lyon no. 7, L. D. Larson. Oahu: Tantalus, 1909. Atkinson's list as determined by Rehm.

No. 179. **Nummularia mauritanica** Berk. and Cooke, Grevillea, vol. 12, p. 6, 1883

On *Metrosideros polymorpha.* Maui: Kailua, Lyon no. 31, 1908. Atkinson's list as determined by Rehm.

91. USTULINA Tul. Sel. Fung. Carp., vol. 2, p. 23, 1863

No. 180. **Ustulina zonata** (Lév.) Sacc.[13] Syll. Fung., vol. 1, p. 352, 1882.

On wood; Oahu: Manoa valley, May 24, no. 77.

92. HYPOXYLON Bull. Hist. Champ. Fr., vol. 1, p. 168, 1791

No. 181. **Hypoxylon annulatum** (Schw.) Mont. Syll. Crypt. p. 213, 1856

On *Acacia koa.* Hawaii: Kilauea, July 15, no. 851. Collected also by C. Judd, June 11, no. 376. Forest below Pau. June, 1915, Forbes nos. 866 and 550; also Tantalus, Oct. 5, 1913, Lyon no. 396.

No. 182. **Hypoxylon effusum** Nitschke. Pyren. Germ. p. 48, 1867

On *Mangifera indica.* Forbes no. 555.

[12] Determined by H. Sydow.
[13] Determined by H. Sydow.

No. 183. **Hypoxylon archeri** Berk. Fl. Tasm. vol. 2, p. 280, Lyon no. 55a of Atkinson's List.

No. 183a. **Hypoxylon marginatum** (Schw.) Berk., Jour. Linn. Soc., vol. 10, Cuban Fungi, p. 385, n. 830. 1886, Atkinson's list no. 107.

No. 184. **Hypoxylon placentiforme** Berk. et Curt. Jour. Linn. Soc., vol. 10, p. 383, 1869. Oahu: Manoa valley, Dec. 1909. Forbes no. 24.

No. 185. **Hypoxylon rubiginosum** (Pers.) Fries, Summa Vig. Scand. p. 384, 1849, Hawaii, Keauhou, July 21, T. White. no. 1017.

No. 186. **Hypoxylon sandwicense** Reich. Krypt. Haw. (153, p. 6.)
On rotten wood. Wawra, 1831, 1832.

93. XYLARIA Hill Hist. Pl., p. 62, 1773

No. 187. **Xylaria schweinitzii** Berk. and Curt.
Oahu: Olympus, Feb. 1911, Forbes no. 18; Manoa valley, May 24, nos. 75, 79; Waiahole ditch trail, June 12, no. 378. Also Forbes no. 418, on Aleurites.

No. 188. **Xylaria apiculata** Cooke.
Hawaii: Keauhou, Kona, Bishop Estate road, July 25, no. 996.

No. 189. **Xylaria curta** Fries, Nova Act. Soc. Sci. Upsal. 3rd ser., vol. 1, p. 125, 1851.
On rotten Aleurites. Maui: Wawra, no. 1964.

No. 190. **Xylaria gigantea** (Zipp. & Lév.) Fries, Nova Act. Soc. Sci. Upsal, 3rd ser., vol. 1, p. 127, 1851
Lyon no. 2. Atkinson's list.

No. 191. **Xylaria hypoxylon** (L) Grev. Fl. Edin., p. 335, 1824
On rotten wood. Maui: Wawra, 1838. Also Atkinson's list, Lyon no. 50.

No. 192. **Xylaria morchelliformis** Rehm, Ann. Myc., vol. 9, p. 371, 1911
Lyon no. 55 of Atkinson's list.

No. 193. **Xylaria multiplex** (Kuntz & Fries) Berk. and Curt., Cuban Fungi no. 795, 1869
Oahu: Wailupe, 1909, Lyon no. 73, Atkinson list.

No. 194. **Xylaria rhopaloides** Krs. Mont. Ann. Sci. Nat. 4th ser., vol. 3, p. 99, 1855

On *Acacia koa*. Hawaii: Keauhou, Kona, Bishop Estate road, July 21, no. 918 and Forbes no. 400.

No. 195. **Xylaria tuberosa** (Pers.) Cooke, Grevillea, vol. 11, p. 88, 1883
Sphaeria tuberosa Pers. Gaudichaud-Beaupré, Voy. Freye. Bot., p. 180, 1826

94. PENZIGIA Sacc. Myc. Malac. p. 20, 1888

No. 196. **Penzigia tuberiformis** (Berk.) Rehm.
Xylaria tuberiformis Berk. in Hooker's Fl. Nov. Zel., vol. 2, p. 204, 1855
Xylaria anisapleura Mont. Syll. Crypt. p. 688, 1856

Lyon no. 49. In Atkinson's list as determined by Rehm.

No. 197. **Penzigia globosum** (Fries) Rehm.
Hypoxylon globosum (Fries) Syst. Myc., vol. 2, p. 331, 1823

On Metrosideros. So reported by Rehm in Atkinson's list; also reported by Wawra (153, p. 6), no. 2150.

LABOULBENIALES

The few species of Laboulbenia here listed are taken from Thaxter (191). The hosts[14] are all species of Hawaiian Carabidae. Of the 34 species listed, 5 occur on Kauai, 7 on Oahu, 11 on Maui, 6 on Molokai, 2 on Lanai, and 3 on Hawaii.

95. LABOULBENIA

No. 198. **Laboulbenia cauliculata** Thaxter:
Colpocaccus lanaiensis Shp. Lanai, Maui, Molokai.
" *marginatus*. Shp. Kauai.
Atelothrus depressus Shp. Lanai.
" *constrictus* Shp. Molokai.
Mesothriscus hawaiiensis Shp. Hawaii.
" *alternans* Shp. Kauai.
" *muscicola* (Blkb.) Oahu.
Metromenus fraudator Shp. Molokai.
and other undetermined specimens.

No. 199. **Lauboulbenia cauliculata** var. **prolixa** Thaxter:
Mesothriscus tricolor Shp. Maui, Molokai.
" *collaris* Shp. Molokai.
Metromenus aequalis Shp. Oahu.

No. 200. **Laboulbenia cauliculata** var. **spectabili** Thaxter:
Metromenus caliginosus (Blkb.) Oahu.
" *mutabilis* (Blkb.) Oahu.
" *latifrons* Shp. Molokai.

[14] For the list of hosts I am indebted to Mr. Otto H. Swezey.

No. 201. **Laboulbenia disenochi** Thaxter

Disenochus fractus Shp. Maui.
" *aterrimus* Shp. Kauai.
" *sulcipennis* Shp. Kauai.
Anchonymus agonoides Shp. Maui.
Brosconymus optatus Shp. Oahu.

No. 202. **Lauboulbenia hawaiiensis** Thaxter

Atelothrus erro Blkb. Maui.
" *gracilis* Shp. Maui.
Mauna frigida Blkb. Maui.
Colpodiscus lucipetens Blkb. Maui, Hawaii.
Colpocaccus tantalus Blkb. Oahu.
" *hawaiiensis* Shp. Hawaii.
" *lanaiensis* Shp. Lanai, Molokai, Maui.
" *posticatus* Shp. Kauai.
Mesothriscus muscicola Blkb. Oahu.
" *tricolor* Shp. Maui, Molokai.
" *alternans* Shp. Kauai.
Mecyclothorax pusillus Shp. Maui.
" *ovipennis* Shp. Maui.
" *montivagus* Blkb. Maui.
Bembidium. Numerous undetermined specimens.

No. 203. **Laboulbenia sphyri** Thaxter

Metromenus caliginosus Blkb. Oahu.
" *epicurus Blkb.* Oahu.
" *latifrons* Shp. Molokai.

BASIDIOMYCETES

Uredinales (The Rust Fungi)

Thirty-nine species of rust fungi, five of which are new, occurring on forty-four hosts are herein enumerated. Of these only seven appear to have been mentioned in print or to have been distributed as specimens. Seventeen others are found in previous collections, while fifteen are additions to the Hawaiian rust flora as previously known. Seven of the rusts are endemic, thirty-nine are known to occur elsewhere. Twenty of the rusts are on hosts known to have been introduced since the advent of the white man to the Hawaiian Islands, and three others are found on hosts probably of recent introduction.

Many of the introduced forms were brought to the islands with the voluntary introduction of such hosts as the carnation, rose, corn, sorghum, alfalfa, peach, blackberry, bean, wheat, oats, or Bermuda grass. Others were doubtless introduced by accident, e.g., dandelion, cocklebur, etc. Eighteen (41%) of the host species may be regarded as indigenous; eleven of these (25% of all the hosts) as endemic; four of the hosts are of unknown history on the islands. On six of the endemic hosts, *Acacia koa,*

Wikstroemia, Alyxia, two Euphorbias, and Vaccinium, there was no well established infection, only a few isolated sori.

Rusts known to have been introduced with their hosts flourish as they do elsewhere; indeed I think that, in general, they are more abundant, more generally present over the leaf surface of an infected plant than they are in the country from which they came. Illustrations of this are afforded by rust of peach, alfalfa, Bermuda grass and many others. It is therefore obvious that there is nothing inimical to rust growth in the insular conditions. It may well be that the weak development of rust on the endemic host indicates a comparatively recent, and as yet incomplete, adaptation of the parasite to a new host. It is further noticeable that of the six endemic rusts five are found on six endemic hosts and the fifth on an indigenous host.

The scant number of rusts as compared with those to be found in the Continental sub-tropics or sub-tropical continental islands is striking. Porto Rico lies relatively near to continental land in a climate closely approximating that of Hawaii, has an area of 3606 square miles and an elevation of only about 3,700 feet. Hawaii, with 6,455 square miles of area and an elevation reaching to 13,825 feet, and a consequent range in temperature from 96° F. to 18° F. in summer, also has a much greater range in annual rainfall, from 549 inches on Waialeale, Kauai, to 7.9 inches at Puu Kea on Hawaii. In temperature, rainfall, and elevation Hawaii gives greater range than does Porto Rico. Comparisons of the Hawaiian rust flora with that of continental areas are made in the following table:

TABLE II.—SHOWING PROPORTION OF RUST FLORAS TO VASCULAR PLANTS

	NUMBER OF SPECIES OF VASCULAR PLANTS KNOWN	NUMBER OF RUSTS KNOWN		RUST RATIO	
		Species	Genera	Species	Genera
Hawaii	999[a]	39	9	.039	.009
Porto Rico.....	2250	175	19	.077	.008
Indiana	2339	172	26	.073	.011
Wisconsin	2099	202	21	.096	.01

a This number I select from Hillebrand's Flora of the Hawaiian islands rather than from a more recent census; it gives a fairer ratio, as the fungus census is, at present incomplete.

My collections of the Hawaii fungi are not exhaustive, but I believe, nevertheless, that the above comparisons are legitimate and that the conclusion is forced that the scarcity of rusts is due solely to the geographic isolation of the Hawaiian islands which lie more than 1,000 miles from any considerable land body.

The absence of aecial forms (one only being found and that an introduced species) is more likely to be linked with paucity of species than with any ecological suppression of aecial stages, since aecia are found plentifully in Porto Rico. It appears to me probable that the rusts have not come wind-borne, separate from their hosts, to Hawaii—if so more rusts would be found there—but rather that rust and host must arrive together, which condition, being subject to greater accident liability, renders successful, natural, rust immigration extremely difficult.

In the list of Hawaiian rusts on page 176 the symbols *e, i, r,* signify respectively, endemic, indigenous (introduced prior to the advent of white men) and recent (introduced since the advent of white men). The hosts bearing endemic rusts are starred. Similarly in the list showing approximate sources (p. 176) *e* signifies endemic, *r,* recent, and * neither recent nor endemic, that is, probably, though by no means certainly, indigenous. Probable eastern (American), origin, according to such evidence as we possess regarding rust distribution, is indicated by the letter *E;* western origin by the letter *W* and a possible eastern or western origin is indicated by the letters ew.

This list shows that aside from the endemic and recent rusts, there are ten which occur upon plants of the original flora, but which are also known elsewhere in the world. Of these rusts six are known to occur only in the East (America), one in the West (Australia, Japan, etc.), and three both in the East and the West. It is possible that more complete knowledge of the rusts of South America and of the land west of Hawaii may change the evidence, but at present it appears that the Hawaiian rust flora on indigenous plants shows more influence from America than from the Far East.

Family, COLEOSPORIACEAE

96. COLEOSPORIUM Lév. Ann. Sci. Nat., 3d sér., vol. 8, p. 373, 1847

No. 204. **Coleosporium paederiae** Diet. Ann. Myc. vol. 7, p. 355, 1909
Lit. Syd., Monog. Ured., vol. 3, p. 637, 1915

On *Paederia foetida.* Oahu: Tantalus, June 22, no. 648; Nuuanu valley, May 27, no. 119; Palolo valley, June 10, no. 317; Kalihi valley, June 2, no. 174. Collections were also made by Lyon in 1907 and 1909 in Nuuanu and Manoa valleys (Lyon nos. 1 *a* and 42).

The rust is very common on the host, usually present wherever the host is found, often seen in great abundance on the leaves, almost covering them. It was previously recorded from Japan on *Paederia tomentosa.*

Family, MELAMPSORACEAE

97. **PUCCINIASTRUM** Otth, Mitth. Nat. Ges. Bern, 1861, p. 71.

No. 205. **Pucciniastrum myrtilli** (Schum.) Arth. Résult. Sci. Congr. Bot. Vienne, p. 337, 1906. Lit. Arth. N. A. F., vol. 7, p. 109, 1907; Syd. Monog. Ured., vol. 3, p. 462, 1915

On *Vaccinium reticulatum.* Hawaii: Kilauea, July 13, no. 818.

The fungus was very sparse and inconspicuous, occurring only as isolated sori. Previously recorded on Gaylussacia and Vaccinium; widely distributed throughout the United States and in Europe, Greenland, and Asia.

No. 206. **Pucciniastrum wikstroemiae** Arthur n. sp.

II. Uredinia hypophyllous, in small groups of two to six or solitary, causing little or no discoloration, bullate, roundish or oblong, large, 0.6-1 mm. across, epidermis rupturing irregularly and remaining overarched; peridium delicate, colorless; peridial cells imbricated, with walls less than 1 μ thick; uredinospores oblong, obovate or globoid, 15-18 by 18-26 μ; wall colorless, 2-3 μ thick, sparsely echinulate.

III. Telia unknown.

On *Wikstroemia uva-ursi.* Hawaii: Kapapala ranch, July 18, no. 892.

The fungus, consisting of but single, scattered sori, was very inconspicuous, though the upper leaf surface adjacent to a sorus was slightly yellowed. Though collected in only one locality, it may be wide-spread and have been overlooked because so inconspicuous.

98. **UREDINOPSIS** Magn. Atti. Congr. Bot. Genova, p. 167, 1893

No. 207. **Uredinopsis pteridis** Diet. and Holw. II. Ber. Deut. Bot. Ges., vol. 13, p. 331, 1895. Lit. Syd. Monog. Ured., vol 3, p. 498, 1915

On *Pteridium aquilinum.* Collected by Lyon. Maui: July 19, 1909, Lyon no. 92.

Arthur (4) speaks of this collection as notable for its very coarsely verrucose spores. Previously recorded from western North America and Florida.

Family, PUCCINIACEAE

99. **RAVENELIA** Berk. Gard. Chron., p. 132, 1853

No. 208. **Ravenelia siliquae** Long, II. Bot. Gaz., vol. 35, p. 118, 1903 Lit. Arth., N. A. F., vol. 7, p. 135, 1907; Syd. Monog. Ured., vol. 3, p. 240, 1915

On *Acacia farnesiana.* Oahu: Hillebrand gardens, Honolulu, May 22, no. 54. Also collected by Lyon on Oahu at Honolulu, Aug. 31, 1912, Lyon no. 157. Previously recorded on the same host from Mexico.

100. TRANZSCHELIA Arth. Résult. Sci. Congr. Bot. Vienne, p. 340, 1906

No. 209. **Tranzschelia punctata** (Pers.) II Arth. Résult. Sci. Congr. Bot. Vienne, p. 340, 1906. Lit. Arth. N. A. F., vol. 7, p. 151, 1907. Syd. Monog. Ured., vol. 1, p. 484, 1904

On *Prunus persica* (peach). Hawaii: Keauhou, N. Kona, Bishop Estate road, July 21, no. 911; Kukuihaele, August 2, no. 1107. Kauai: pipeline, Waimea canyon, June 15, no. 424. Maui: Olinda pipeline, Sept. 5, no. 1142.

Also collected by Lyon in 1908 on Hawaii at Hilo in August, 1914, on Oahu at the Hawaii Agricultural Experiment Station at Honolulu, and at Wahiawa in 1912. Reported also by Heller. Apparently present wherever the host occurred. Previously recorded as occurring throughout the United States and Eastern Canada, in the Canary Islands, the West Indies, Central and South America, Europe, Africa, and Australia. Often recorded under the name *Puccinia pruni-spinosae*.

101. PHRAGMIDIUM Link, Ges. Nat. Freunde Berlin, Mag. vol. 7, p. 30, 1816

No. 210. **Phragmidium disciflorum** (Tode) James, Contr. U. S. Nat. Herb., vol. 3, p. 276, 1895. Lit. Arth. N. A. F., vol. 7, p. 171, 1912. Syd., Monog. Ured., vol. 3, p. 115, 1915.

On *Rosa* (cult.) Oahu: Honolulu, April 16, 1913, Lyon no. 315 and Jan. 7, 1916, Lyon no. 450. Collected also by Heller, no. 2802, above Waimea on Kauai, Sept. 9, 1895.

Previously reported as found on roses throughout North America and also in Madeira Islands, Europe, Western Asia, Africa, South and Central America, Australia, and Hawaii. *Phragmidium subcorticum* listed by Heller in his Hawaiian collection is very probably this same form.

102. KUEHNEOLA Magn. Bot. Cent., vol. 74, p. 169, 1898

No. 211. **Kuehneola uredinis** (Link) Arth. II, N. A. F., vol. 7, p. 186, 1912, or Résult. Sci. Congr. Bot. Vienne. 1905. Lit. Syd. Monog. Ured., vol. 3, p. 315.

On *Rubus villosus*. Maui: Olinda pipeline, Sept. 5, nos. 1147 and 1134.

Previously reported from eastern United States and Pacific Coast and in Europe on many species of Rubus. This rust was present in great abundance on all plants of the host species in the only locality where the host was seen. The diseased branches grew over a large area interlocked with another Rubus (*R. mcraei*). Close search failed to reveal any infec-

tion of this native species. The host is listed in no Hawaiian flora and is not in the herbarium of the Bishop Museum, and appears to have been of quite recent introduction.

103. UROMYCES Link, Gesell. Nat. Freunde Berlin, Mag., vol. 7, p. 28, 1816

No. 212. **Uromyces alyxiae** Arthur n. sp.

III. Telia hypophyllous and petiolicolus, on brownish or blackened, somewhat thickened spots, irregularly roundish, 0.3-0.8 mm. across, crowded and sometimes coalescent, prominent, soon naked, light cinnamon-brown, becoming cinereous by germination, ruptured epidermis inconspicuous; teliospores oblong, broadly ellipsoid, or obovate, obtuse or rounded above and below, 14-16 by 23-30 μ; wall pale cinnamon-brown, thin at sides, 1 μ thicker above, 3-7 μ, smooth; pedicel pale-yellowish, slender, once to twice length of spore or more.

On *Alyxia olivaeformis*. Kauai: Kalalau trail, June 16, nos. 519 and 520 (type). Hawaii: Keauhou, Kona, Bishop Estate road, July 25, no. 1011; Hamakua, upper ditch trail, July 28, no. 1026 and July 31, no. 1081; collected by O. H. Swezey, Alakai Swamp, August 22, no. 1167.

Although this rust was collected on the two most widely separated islands, Kauai and Hawaii, it was found nowhere in more than very scant quantity. Hundreds of the host plants were examined and showed no rust, and when it was present, it was in very inconspicuous quantity, only a few scattered sori on single leaves. In extremely rare instances only was a leaf found showing many sori.

No. 213. **Uromyces appendiculatus** (Pers.) Fries, Summa Veg. Scand., p. 514, 1849. Lit. Arth. N. A. F. vol. 7, p. 357, 1920. Syd. Monog. Ured., vol. 2, p. 120, 1910

Collected on bean (*Phaseolus*) by C. W. Carpenter in 1918.

On *Vigna catjang*. Oahu: Sugar Co. plantation, July 23, 1919, Lyon no. 488.

Previously reported in the United States, West Indies, Europe, Africa, Asia, Japan, Australia and South America.

No. 214. **Uromyces caryophyllinus** (Schr.) Wint. in Rab. Krypt. Fl., vol. 1, p. 149, 1881. Lit. Arth. N. A. F., vol 7, p. 246, 1912. Syd. Monog. Ured., vol. 2, p. 210, 1910.

Collected by Lyon on carnation (Dianthus). Oahu: Honolulu, March 10, 1913, Lyon no. 294.

Previously reported from North America, Europe, Asia, Africa, Japan and Australia.

No. 215. **Uromyces koae** Arthur n. sp.

II. Uredinia amphigenous, irregularly grouped on indefinite yellowish spots, or covering the whole surface of hypertrophied shoots, soon naked, applanate, cinnamon-brown, pulverulent, ruptured epidermis scarcely noticeable; urediniospores broadly fusiform or fusiform-oblong, 16-23 by 32-45 μ; wall light golden-brown, or yellowish, uniformly 2.5-3.5 μ thick, closely and prominently verrucose, the pores 6, distinct, equatorial.

III. Telia similar to the uredinia, but usually confined to the phyllodia and on more definite reddish spots; teliospores broadly ellipsoid or oblong-obovate, 16-20 by 26-35 μ, obtuse or rounded above and below; wall golden-brown or yellowish, 1-2 μ thick at sides, much thicker above, 7-12 μ, irregularly roughened above with blunt conical tubercles increasing in size toward the apex; pedicel colorless, slender, half length of spore or shorter, fragile, deciduous, or partially so.

On *Acacia koa*. Oahu: Ahren's ditch trail, June 8, no. 291. Maui: Pogue's ditch trail, Sept. 6, no. 1158. Collected also by Lyon on Oahu, July 19, 1919 (Lyon no. 4) and on Hawaii, October 10, 1913 (Lyon no. 416); by Swezey on Kauai; by Hosmer on Maui, Honokahua, July 17, 1913, (Lyon no. 359); by North on Oahu, Tantalus, Lyon no. (?) (type). Also collected by Lyon at Kaimuhonu, Oahu, no. 212 (Lyon.)

This rust seems to be generally distributed on the islands wherever the host occurs, sometimes forming conspicuous enlargements, but more often causing only yellow spots with inconspicuous sori.

No. 216. **Uromyces leptodermus** Sydow, Ann. Myc., vol. 4, p. 430, 1906. Lit. Arth. N. A. F., vol. 7, p. 224, 1912. Syd. Monog. Ured., vol. 2, p. 334, 1910

On *Panicum barbinode*. Oahu: Between Diamond Head and King street, Honolulu, May 18, no. 16; Manoa valley, May 24, no. 66; Tantalus, May 25, no. 105; Wahiawa, May 31, no. 162. Kauai: Waimea, June 17, no. 544. Hawaii: Wailuku river, July 8, no. 749; Kona, July 25, no. 972. Also collected by Lyon on Oahu at Hawaii Agric. Exp. Sta., Honolulu, April 21, 1913, Lyon no. 318; April 3, 1913, Lyon nos. 307 and 301. Common where the host occurred. Previously reported on the same host from Florida, Cuba, Guatemala, and India.

No. 217. **Uromyces medicaginis** Pass. II. Thüm. Herb. Myc. Oecon., p. 156, 1874. Lit. Arth. N. A. F., vol. 7, p. 256, 1912. Syd. Monog. Ured., vol. 2, p. 116, 1910

On *Medicago sativa* (alfalfa). Oahu: Honolulu, May 20, nos. 28 and 377. Collected also by Lyon in 1921.

Common where the host occurred. Previously reported from Dakota to Massachusetts and southward, also on the Pacific Coast in the United States, in Mexico, Europe, India and South America.

No. 218. **Uromyces proeminens** (DC) Pass. Rab. Fungi Eur. Exsic. 1795, 1874. Lit. Arth. N. A. F., vol. 7, p. 259, 1912. Syd. Monog. Ured., vol. 2, p. 158, 1910

On *Euphorbia serpyllifolia.* Oahu: Honolulu, June 4, nos. 270, 271, 274 and June 2, no. 188; Ahren's ditch trail, Wahiawa, June 8, no. 295. Hawaii: Kukuihaele, August 2, no. 1099. Maui: Iao Valley, Sept. 7, no. 1154.

Both aecial and uredinial forms were common where the host occurred. This is notable as the only aecial form collected in the Hawaiian Territory.

Previously reported from Connecticut to Minnesota and Vancouver Island and southward through the United States, Mexico, Central America, the West Indies, also South America, Europe, Asia and Africa.

No. 219. **Uromyces rhyncosporae** El., Jour., Myc., vol. 7, p. 274, 1893. Lit. Arth. N. A. F. vol. 7, p. 232, 1912. Syd. Monog. Ured., vol. 2, p. 302, 1910

On *Rhyncospora lavarum.* Oahu: Kalihi valley, June 2, nos. 170 and 180; Palolo valley, June 16, no. 349; Wahiawa, June 3, no. 216; Tantalus, June 24, no. 683. Hawaii: Kilauea, July 16, no. 863. Collected also by L. D. Larsen on sedge. Molokai: Oct. 21, 1913, no. 49.

Previously reported in the eastern United States and Canada, and in the Bermudas, Brazil, and the West Indies.

No. 220. **Uromyces scirpi** (Cast) Burr. II Bot. Gaz., vol. 9, p. 188, 1884. Lit. Arth. N. A. F., vol. 7, p. 233, 1912. Sydow. Monog. Ured., vol. 2, p. 302, 1910.

On *Scirpus paludosus.* Oahu: Honolulu, between Diamond Head and King street, May 19, no. 8. Collected also by Lyon at Kapiolani Park, April 16, 1913, Lyon no. 311.

Very abundant where the host occurred.

Previously reported from Montana to Nova Scotia and southward, also in Central California and in Europe.

104. PUCCINIA Pers. Tent. Disp. Fung., p. 38, 1797

No. 221. **Puccinia callaquensis** Neger. Anal. de la Univ. Santiago de Chili, 1896, vol. 93, p. 777. Lit. Sydow, Monog. Ured. vol. 1, p. 465, 1904.

Collected by Forbes on *Geranium arboreum.* Maui: Haleakala, July, 1919, Forbes no. 697.

Previously known only on *Geranium berteroanum* in Chili.

No. 222. **Puccinia cenchri** Diet. and Holw. Bot. Gaz. vol. 24, p. 28, 1897. Lit. Arthur, N. A. F. vol. 7, p. 294. Sydow, Monog. Ured. vol. 1, p. 743, 1904

On *Cenchrus hillibrandianus.* Oahu: School street, Honolulu, May 28, no. 131; between Diamond Head and King street, Honolulu, May 19, no. 20; Maunalua, May 29, no. 141.

The rust was common where the host occurred. Previously known on several other species of Cenchrus from southern United States to Panama, also the West Indies and Brazil.

No. 223. **Puccinia chrysanthemi** Rose II Bull. Soc. Myc. d. France. 1900. Lit. Sydow, Monog. Ured, vol. 1, p. 46, 1904

Collected by L. D. Larson.

On *Chrysanthemum indicum* (cult). Oahu: Waialae, Oct. 10, Lyon no. 402.

Previously reported on cultivated Chrysanthemum in Europe, Japan, and North America.

No. 224. **Puccinia clematidis** (DC) II, III. Lagerh. Tromsö Mus. Aarsh. vol. 17, p. 54, 1895. Lit. Arthur, N. A. F. vol. 7, p. 333.

(*P. triticina* Erkiss.).

On wheat (Triticum). Oahu: Wahiawa. Collected by L. D. Larson, July 15, 1910.

Isolated wheat plants resulting from scattered seed, wherever found, were usually rusted heavily.

Previously known throughout North America, Europe, Asia, and Australia.

No. 225. **Puccinia conoclinii** Seym. II Bot. Gaz. vol. 9, p. 191, 1884. Lit. Sydow, Monog. Ured. vol. 1, p. 85, 1904

On *Ageratum conyzoides.* Oahu: Wahiawa, Ahren's ditch trail, June 8, no. 281, and May 31, no. 168.

Collected by L. D. Larson, Tantalus, Sept. 17, 1909. Reported as *Puccinia compositarum* from Kauai by Heller, no. 2789.

The rust was usually present in abundance where the host occurred. Previously reported on two species of Eupatorium from Illinois and Louisiana, but much more widely distributed in North America.

No. 226. **Puccinia cynodontis** Lacroix. II. in Desmar. Pl. Crypt. II. p. 655, 1859. Lit. Arthur, N. A. F. vol. 7, p. 315. Sydow Monog. Ured. vol. 1, p. 748, 1904

On *Capriola dactylon.* Oahu: Honolulu, May 19, no. 22 and May 20, no. 30; between Diamond Head and King street, Honolulu, May 19, no. 10.

Hawaii: Puna, July 9, no. 761; Waimea, July 27, no. 1023 and July 30, no. 1045; Kilauea, July 13, no. 816 and July 12, no. 796.

This rust, though very inconspicuous, was found wherever the host occurred.

Previously recorded on this host only in the southern United States, Guatemala, Panama and West Indies, Europe, Asia, Africa, and Japan.

No. 227. **Puccinia epiphylla** (L.) Wettst. Verh. Zool-Bot. Ges. Wien. p. 541, 1886. Lit. Arthur, N. A. F. vol. 7, p. 327. Sydow, Monog. Ured. vol. 1, p. 795, 1904

On *Poa annua.* Hawaii: Kilauea, July 12, nos. 797 and 827.

The rust is quite inconspicuous and may well be of much more general distribution than the one collection indicates.

Previously recorded on members of several genera of grasses in North America, Europe and Japan.

No. 228. **Puccinia esclavensis** Diet. & Holw. II. Bot. Gaz. vol. 24, p. 29, 1897. Lit. Arthur, N. A. F. vol. 7, p. 292. Sydow, Monog. Ured. vol. 1, p. 772, 1904

On *Panicum nephelophilum.* Kauai: Pipe trail, Waimea canyon, June 15, no. 423.

The host was found only once and was then heavily rusted. Previously known on several species of Panicum from Texas, New Mexico, and south to Guatemala.

No. 229. **Puccinia geranii-silvatici** Karst. Enum. Fung. Lapp. or. 220, 1866. Lit. Sydow, Monog. Ured. vol. 1, p. 465, 1904

On *Geranium glabratum.*[15] Hawaii: Waimea, July 29, no. 1037.

Previously known in Europe, Asia, South America, and India on several species of Geranium.

No. 230. **Puccinia heterospora** B. and C. Jour. Lin. Soc. vol. 10, p. 356, 1868. Lit. Sydow, Monog. Ured, vol. 1, p. 472, 1904

On *Abutilon molle.*[15] Oahu: Hillebrand gardens, Honolulu, May 23, no. 44; School street, Honolulu, May 28, no. 127; Kalihi valley, June 2, no. 177. Hawaii: Keauhou, Kona, Bishop Estate road, July 21, no. 907; and July 22, nos. 923 and 924; Puna, July 9, no. 753; Kukuihaele, Aug. 2, no. 1098. Maui: Iao valley, Sept. 7, no. 1151. Collected also by Lyon at Hana, Maui, March, 1909; at Pahala, Hawaii, Feb. 17, 1916, Lyon no. 454, and by Swezey at Kaala, Oahu, Nov. 20, 1921.

The rust was present wherever the host was found.

[15] Determined at Kew and name communicated by W. R. Maxon.

On *Abutilon incanum*[16]. Oahu: Kaimuki, Dec. 1921. Collected by Swezey.

Previously known on many Malvaceae in North America, Mexico, Honduras, Bolivia, Brazil, Argentine, Antilles, Africa, India, Australia, Philippines, and China.

No. 231. **Puccinia huberi** P. Henn. II. Hedw. Beib. vol. 39, p. 76, 1900. Lit. Arthur, N. A. F. vol. 7, p. 287. Sydow, Monog. Ured. vol. 1, p. 771, 1904

On *Paspalum orbiculare*. Oahu: Manoa valley, May 23, nos. 65 and 72; Nuuanu pali, May 27, no. 114; Palolo valley, June 10, nos. 323 and 348; Hawaii: Kilauea, July 11, no. 786.

The rust was usually found in scant quantity on the infected plants.

Previously known in the West Indies, southern Mexico and northern South America, on several species of Panicum.

No. 232. **Puccinia hydrocotyles** (Link) Cooke II. in Grev. vol. 9, p. 14, 1880. Lit. Sydow, Monog. Ured. vol. 1, p. 388, 1904

On *Hydrocotyle verticillata*. Oahu: Tantalus, June 22, no. 647; Olympus, June 24, no. 666. Kauai: Kalalau trail, June 16, no. 515. Hawaii: Kilauea, July 16, no. 855; Hamakua upper ditch trail, July 28, no. 1031. Reported also by Heller.

The rust was usually found to be present where the host occurred and often in considerable abundance. Previously known on many species of Hydrocotyle in Europe, southern United States, South America, and Africa.

No. 233. **Puccinia oahuensis** E. and E. Bull. Torr. Bot. Cl. vol. 22, p. 435, 1895. Lit. Sydow, Monog. Ured. vol. 1, p. 771, 1904.

On *Syntherisma pruriens*. Oahu: Makiki, March 21, 1895, Heller no. 1976 (type); Honolulu, June 16, 1916, no. 13735; and Halfway House, Tantalus, June 24, 1916, no. 13862, Hitchcock; Nuuanu pali, May 27, nos. 121 and 124; Tantalus, June 20, no. 590; Kolekole pass, June 27, nos. 731 and 732. Hawaii: Kukuihaele, Aug. 2, no. 1105.

Usually present in quantity where the host occurred. Reported by Heller as no. 1976 on "unknown grass"; by Sydow as above. Known only in Hawaii.

No. 234. **Puccinia polygoni-amphibii** Pers. Syn. Fung. 227, 1801. Lit. Arthur, N. A. F. vol. 7, p. 381. Sydow, Monog. Ured. vol. 1, p. 569, 1904

On *Polygonum sp.* Hawaii: Waimea, July 30, no. 1052; Hamakua,

[16] Determined by S. F. Blake.

upper ditch trail, July 31, no. 1056. Collected also by Lyon on *Polygonum glabrum* at Kaunakakai, Molokai, December 21, 1913, Lyon no. 20.

The rust was present in but scant quantity.

Previously known on many species of Polygonum in North and South America, Europe, Africa, India, China and Japan.

No. 235. **Puccinia purpurea** Cooke. II. Grev. vol. 5, p. 15, 1876. Lit. Arthur, N. A. F. vol. 7, p. 284. Sydow, Monog. Ured. vol. 1, p. 803, 1904.

On *Holchus halepensis* (cult). Oahu: Hillebrand gardens, Honolulu, Aug. 18, no. 1131; Oahu: May 22, no. 33; Manoa valley, May 23, no. 69.

Collected also by Lyon on Johnson grass, at Round Top, Oahu, May 11, 1921, Lyon no. 333 and also on "Jerusalem corn," Hawaii, Sept. 19, 1910, and on sorghum by L. D. Larson, Wahiawa, Oahu, May 23, 1913, Lyon no. 339.

The rust was usually very abundant, both on cultivated and wild hosts. Previously known on various sorghums in the southern United States, West Indies, Central America, South America, Europe, Asia, Africa, Hawaii, India and Java.

No. 236. **Puccinia rhamni** (Pers.) Wettst. III. Ver. Zool.-Bot. Ges. Wien, vol. 35, p. 545, 1886

P. coronata Cda. Lit. Arthur, N. A. F. vol. 17, p. 313. Sydow, Monog. Ured. vol. 1, p. 699, 1904.

On *Notholcus lanatus*. Kauai: Kalalau trail, June 16, no. 527; Pipe trail, Waimea canyon, June 15, no. 488. Hawaii: between Hilo and Kilauea, July 10, no. 579; Kilauea, July 16, no. 852. Maui: Olinda pipeline, Sept. 16, no. 1140.

On *Avena sativa* (oats). Oahu: Wahiawa, June 3, no. 219; Kolekole pass, June 3, no. 730. Collected also on oats by Lyon at Honolulu, Hawaii, Agr. Exp. Sta., April 21, 1913 (Lyon no. 317) and Feb. 4, 1913 (Lyon no. 265); on Hawaii at Glenwood, March 13, 1913, by L. D. Larson (Lyon no. 295). Previously known in North America to Southern Mexico, West Indies, Europe, Asia, Australia and Africa on many genera of grasses.

No. 237. **Puccinia taraxaci** (Reb.) Plowr. Monog. Ured. p. 186, 1889. Lit. Sydow, Monog. Ured. vol. 1, p. 164, 1904

On *Taraxacum officinale*. Hawaii: Waimea, July 30, no. 1043. This rust was abundant on the few dandelions seen. Previously known in Europe, North America, and Japan.

No. 238. **Puccinia velata** (E. and E.). Arth. II. Am. Jour. Bot. Vol. 5, p. 472, 1918

On *Euphorbia multiformis*. Oahu: Ewa, collected by O. H. Swezey,

Jan. 29, 1922. Reported as *Uredo velata* on *Euphorbia cordata* by Heller, no. 2027.

On *Euphorbia hookeri.* Oahu: Waihole ditch trail, June 12, no. 396.

No. 239. **Puccinia versicolor** Diet. & Holw. II. Bot. Gaz. vol. 24, p. 28, 1897. Lit. Sydow, Monog. Ured. vol. 1, p. 724, 1904

On *Heteropogon contortus.* Oahu: Maunalua, May 29, no. 133; Tantalus, May 23, 1909, Lyon no. 94. Hawaii: Puna, July 9, no. 762-3.

Previously known from Mexico and Argentine.

No. 240. **Puccinia xanthii** Schw. in Syn. Fung. Carol. p. 73, 1822; Sydow, Monog. Ured. vol. 1, p. 184, 1904

On *Xanthium italicum.* Oahu: Between Diamond Head and King street, May 19, nos. 14 and 23; Honolulu, May 28, no. 128. Kauai: Waimea, June 17, no. 541; also reported by Heller. Collected also by Lyon on Oahu at Waialua; at Honolulu, March 9, 1910 (Lyon no. 127) and by Forbes at Kaimuki, Feb. 1915 (Forbes no. 2285); also by Swezey, Kaala, Nov. 20, 1921.

This rust was abundant wherever the host occurred.

Previously known in North America on various species of Xanthium and Ambrosia.

105. UREDO Pers. in Usteri n. Ann. vol. 9, p. 16

No. 241. **Uredo hawaiiensis** Arthur n. sp.

Uredinia hypophyllous, somewhat grouped or solitary, linear, 0.2-0.3 mm. broad by 0.5-6 mm. long, rather tardily naked, cinnamon or chestnut-brown, somewhat pulverulent, ruptured epidermis evident; urediniospores globoid or broadly ellipsoid, 18-23 by 21-27 μ; wall golden or chestnut-brown, thick, 2-5 μ, sparsely echinulate, the pores 3-5, evident, sometimes in the equator, more often scattered.

On *Carex oahuensis.* Hawaii: Kilauea, July 17, no. 880.

No. 242. **Uredo stevensii** Arthur n. sp.

Uredinia amphigenous, in circinnating groups 3-5 mm. across, on somewhat larger discolored areas, roundish or elongate, large, 0.3-0.8 mm. across, soon naked, dark cinnamon-brown, pulverulent, ruptured epidermis noticeable; urediniospores obovate or oblong 15-23 by 28-32 μ; wall cinnamon-brown, 2.5-3.5 μ thick, rather sparsely and prominently echinulate, the pores 3 or 4, equatorial, distinct.

On *Euphorbia clusiaefolia.* Kauai: Pipe trail in Waimea Canyon, June 15, no. 428 (type).

On *Euphorbia sps.* Oahu: Ahren's ditch trail, June 8, no. 278.

These specimens have been carefully compared with the Mexican material of *Puccinia velata* described by J. C. Arthur and, he remarks, that this new species "is well characterized by the equatorial pores and other characters, and is wholly unlike any form known to me."

Ustilaginales (The Smut Fungi)

The smut flora of Hawaii is most remarkable in that, aside from four smuts of cultivated cereals and clearly introduced by white men, there are only three smuts known on the islands. *Sorosporium paspali* is on *Paspalum orbiculare,* which is regarded as a native grass; *Sphacelotheca monilifera* was reported by Heller; *Entyloma crastophilum* has been reported on Holcus.

Corn has long been grown on the islands, since in 1844 is included in Wyllie's Notes a reference to corn as among the chief productions of the islands, while under date Jan. 11, 1813, in Marin's Journal is reference to "Maise" plantings,[17] yet careful search has as yet failed to show the presence of corn smut there. The absence of this and of other grass smuts presents an argument of some weight against theories postulating wind-carriage of fungi to the islands.

106. SOROSPORIUM Rud. Linnea vol. 4, p. 116, 1829

No. 243. **Sorosporium paspali** McAlp. The Smuts of Australia: 180, 1910.[18]

Sori involving the entire inflorescence (occasionally destroying the lower spikes with the upper free, or with the rachis and base of the spikelets only infected), more or less hidden by the enveloping leaf sheaths especially at first, linear, 4 to 9 cm. in length, with prominent, false, whitish membrane gradually flaking away and revealing dusty brown-black spore mass and evident remains of rachis as the columella; hyaline sterile cells of false membrane adhering rather firmly together, but with pressure separating somewhat into threads, chiefly oblong (or rounded with age), smaller than the spores (narrower but often as long as the spores); spore-balls according to McAlpine "dark-brown, globose to oblong or irregular, 30-40 μ in diameter or 30-50 μ long, at first firm, but afterwards readily separating"; spores dark reddish-brown, subspherical to oval, or irregularly polygonal through pressure, apparently smooth but with minute granular scales showing under an immersion lens, 13-18 μ, rarely 20 μ in length.

On *Paspalum conjugatum.* Oahu, Tantalus ridge, Sept. 5, 1909, no. 79. Collected by H. L. Lyon.

On *Paspalum orbiculare.* Hawaii: Kilauea, July 11, no. 786 and July 16, no. 867; Kukuihaele, Aug. 2, no. 1097; between Hilo and Kilauea, July 10, no. 786: Wailuku river, July 8, no. 743; Rainbow falls, July 24, no. 1115; Hilo, Aug. 6, no. 1119. Maui: Pogue's ditch trail, Sept. 6, no. 1157. Kauai: Kalalau trail, June 16, no. 507. Oahu: Tantalus, June 22, no. 657, and May 25, no. 103; Palolo valley and Mt. Olympus, June 10, no. 322; Kalihi valley, June 2, no. 179; Maunalua, May 29, nos. 137 and

[17] Letter under date Dec. 12, 1921, from Thos. G. Thrum, communicated by Albert F. Judd.

[18] Description and notes of *Sorosporium paspali* are by G. P. Clinton.

138; Nuuanu Pali, May 27, no. 120; Wahiawa May 31, nos. 154 and 161, June 3, no. 220; October 21, Lyon; Waiahole ditch trail, June 12, no. 392.

Type locality: Queensland (Bailey) on *Paspalum scrobiculatum*. Distribution: Hawaii, Philippines, Queensland.

This species was sent to the writer some years ago by Prof. Atkinson of Cornell, the specimen having been collected by H. L. Lyon, no. 79, on "*Paspalum conjugatum* Berg, Tantalus Ridge, Oahu, Sept. 5, 1909." At that time on comparing the specimen with the other known smuts on Paspalum, eleven in number, we decided that it was different and a preliminary description of it was written under the name of *Sphacelotheca hawaiiensis*. Recent comparison of this with specimens listed by Prof. Stevens show that they are all the same though the hosts are given as different species of Paspalum.

Since this first determination, a description of McAlpine's *Sorosporium paspali* was received on still a different host-species, *Paspalum scrobiculatum*. As the spore measurements of this agreed fairly well with our species, the writer sent for specimens of this fungus on this host. Mrs. Patterson, of the U. S. Department of Agriculture, kindly sent a specimen collected by E. D. Merrill, no. 9717, at Luzon, Philippine Islands, May, 1914. This agrees with our Hawaiian specimens including the presence of the sterile hyaline membrane enclosing the spore mass, though the sterile cells are more gelatinized. Through the kindness of botanists, C. T. White of Brisbane and C. C. Brittlebank of Melbourne, we also received a fragment of the co-type of McAlpine's species collected by Bailey (no. 582) in Brisbane, Queensland. Except for the absence of a sterile membrane, mention of which is not made by McAlpine, and the somewhat more definite indication of spore-balls, this specimen also agrees with ours. The specimen is too fragmentary, however, to show the membrane, even if originally present. Everything considered it does not seem best to consider our species distinct. As to the three species of Paspalum on which the fungus has now been reported, we have merely taken the determinations of the different collectors.

Personally the writer is inclined to believe that the smut is more likely a species of Sphacelotheca than a Sorosporium, as the signs of spore-balls are not very evident in the Hawaiian and Philippine specimens, and more or less obscure in the Queensland specimen. The so-called spore-balls could very well be merely spores mechanically adhering together in small groups, as they frequently do with Sphacelotheca, thus making distinction from those sorosporiums having a false membrane difficult. However, sections of young material may be necessary to decide this point.

The writer has seen no specimens of *Ustilago paspali thunbergii* P. Henn. from Japan. *Sorosporium paspali* is quite different from the specimens on Paspalum the writer has seen, especially from *Ustilago holwayana* of N. America which has somewhat smaller but evidently echinulate spores and no false membrane.

107. SPHACELOTHECA de Bary Vergl. Morph. Pilze, p. 187

No. 244. **Sphacelotheca monilifera** (E. & E.) Clint. Jour. Myc. vol. 8, p. 141, 1902

Ustilago monilifera Ell. and Ever. Bull. Torr. Bot. Cl. vol. 22, p. 362, 1895.
Sphacelotheca monilifera Clint. Jour. Myc. vol. 8, p. 141, 1902.
Ustilago andropogonis-contorti P. Henn. in herb. Holway. See Jour. Myc. vol. 8, p. 141, 1902.

On *Heteropogon contortus*. Reported by Heller.

No. 245. **Sphacelotheca reiliana** (Kuehn) Clint.[19]
On Sorghum. C. W. Carpenter, May 14, 1917. C .W. C. no. 125.

No. 246. **Spacelotheca sorghi** (Lk.) Clint.[19]
On Sorghum. Oahu: Wahiawa, May 23, 1913. L. D. Larsen. Lyon no. 341.

108. USTILAGO Pers. Syn. Fung., p. 224, 1801

No. 247. **Nstilago avenae** (Pers.) Jens.
On *Avena sativa* (oat). Oahu: Honolulu, Hon. Agr. Exp. Sta., May 6, 1913. Lyon no. 327.

No. 248. **Ustilago hordei** (Pers.) Kell. and Sw.
On *Hordeum sativum* (barley). Oahu: Honolulu, 1913. Lyon no. 324.

109. ENTYLOMA de Bary Bot. Zeit., p. 101, 1874

No. 249. **Entyloma crastophilum** Sacc.[20]
On *Notholcus lanatus* (*Holcus lanatus*). Hawaii: Kilauea, no. 856.

FUNGI IMPERFECTI

Though a considerable number of fungi, apparently merely saprophytes, are here listed, no effort was made to collect such. Attention on collecting trips was given primarily to obtaining actual parasites. The number of

[19] Determined by G. P. Clinton.
[20] Determined by H. Sydow.

saprophytes therefore can easily be very greatly augmented. The number of parasitic Fungi Imperfecti in Hawaii is very small. Such genera as Septoria, Phyllosticta, Cercospora, encountered in abundance elsewhere, are in Hawaii comparatively rare, and, if consideration be focused upon the native flora, their rarity becomes much more evident.

KEY TO ORDERS OF HAWAIIAN FUNGI IMPERFECTI

Conidia in pycnidia **Sphaeropsidales**
Conidia not in pycnidia
 Conidiophores innate within the matrix **Melanconiales**
 Conidiophores somewhat superficial **Moniliales**
Conidia unknown **Mycelia sterilia**
Fungus of unknown affinity **Graphiola**

SPHAEROPSIDALES

KEY TO FAMILIES AND GENERA HERE REPRESENTED

Pycnidia spherical, carbonaceous **Sphaerioidaceae**
 Conidia uniform
 Conidia 1-celled, hyaline **Hyalosporae**
 No stroma present
 Not on Erysiphaceae
 Conidiophores not much branched
 Spores less than 15 μ
 On leaves 110. **Phyllosticta**
 On stems 111. **Phoma**
 Spores more than 15 μ 112. **Macrophoma**
 Conidiophores much branched 113. **Dendrophoma**
 On Erysiphaceae 114. **Cicinnobolus**
 Pycnidia in or on a stroma 115. **Fusicoccum**
 Conidia 1-celled, dark **Phaeosporae**
 Conidia small 116. **Coniothyrium**
 Conidia larger
 Pycnidia pale 117. **Harknessia**
 Pycnidia dark 118. **Sphaeropsis**
 Conidia 2-celled, hyaline **Hyalodidymae**
 Conidia 2-celled, dark **Phaeodidymae**
 Conidia several-celled, hyaline **Hyalophragmiae**
 Conidia several-celled, dark **Phaeophragmiae**
 Conidia filiform **Scolecosporae**
 Pycinidia not clypeate
 On leaves 123. **Septoria**
 On stems 124. **Rhabdospora**
 Pycinidia clypeate 125. **Clypeoseptoria**
 Conidia diform 126. **Phomopsis**
Pycnidia spherical, bright colored **Nectrioidaceae**
Pycnidia flattened, dimidiate **Leptostromataceae**

SPHAERIOIDACEAE-HYALOSPORAE

110. PHYLLOSTICTA Pers. in Fr. Syst. Myc., vol. 2, p. 527, 1822

No. 250. **Phyllosticta aricola.** Bubak, Bull. Herb. Boiss. 2 ser. vol. 6, p. 404, 1906

On *Pothos sp.* Oahu: Waikiki, May 18, no. 3; Honolulu, May 20, no. 25.

The spots are considerably larger than called for in the description, being 2-4 mm. in diameter, and often coalescing to form areas 5-8 by 10-15 cm. or larger.

No. 251. **Phyllosticta artocarpi** Speg. Mycet. Argent. V. in Ann. Mus. Buenos Aires, vol. 20, 330, 1910

On living leaves of *Artocarpus incisa.* Oahu: Hakipuu, June 19, nos. 566 and 579*a*.

Spegazzini says that this species tends towards Gloeosporium. Our species seems clearly to be a Phyllosticta with spores not quite so wide as those of the printed description.

No. 252. **Phyllosticta casimiroae** Stevens and Weedon n. sp.

Spots ash color, borders tan, visible from both sides of leaf. Pycnidia amphigenous, 108 by 97-180 μ in diameter; ostiole present, 36-46 μ in diameter. Spores hyaline, 1-celled, 7 by 2-3 μ, ovoid.

On *Casimiroa edulis,* tree no. 176, Hawaii Agric. Exp. Sta. Lyon nos. 329 and 320.

The disease appears to begin at the tip of the leaf and to extend down both sides of the mid rib. Sometimes one entire half of leaf is killed.

No. 253. **Phyllosticta circumscissa** Cooke Grev. vol. II, p. 150, 1883

On *Prunus persica* (peach). Kauai: Waimea pipe trail, June 15, nos. 424-425. Hawaii: Kealakekua, July 21, no. 911.

No. 254. **Phyllosticta codiaei** Stevens and Young, n. sp.

Spots circular, 8-15 mm. in diameter, light brown, margin distinct, brown, raised. Pycnidia epiphyllous, numerous, black, 75-160 μ in diameter; ostiole definite. Conidia elliptic-fusiform, 7-10 μ by 1.5-2 μ, ends acute, slightly green tinted.

On living leaves of *Codiaeum moluccanum.* Oahu: Honolulu, May 20, no. 31.

No. 255. **Phyllosticta colocasiophila** Amy G. Weedon n. sp.

Spots circular, 1-1.5 cm. in diameter, or by coalescence 4 by 6 cm., or larger; buff to dark brown; surrounded by a dark discolored zone; centers rotted, thickly studded with pycnidia which are amphigenous, subepidermal, light brown, 126 by 140 μ to 136 by 158 μ, ostiolate. Spores hyaline, 7-11 by 1.8 μ, oblong, obtuse, two guttulate. (See Pl. x, *F;* fig. 28, *a.*)

On *Colocasia sp.* (taro). Hawaii: Keauhou, Kona, Bishop Estate road, July 23, no. 943; Kilauea, July 16, no. 873.

This fungus appears to be of wide distribution on the islands, and its ravages cause such havoc that the leaves are largely or quite destroyed. Since the taro plant is of such high food value in the Hawaiian islands, this disease is of special interest, and it may prove to be of serious economic importance.

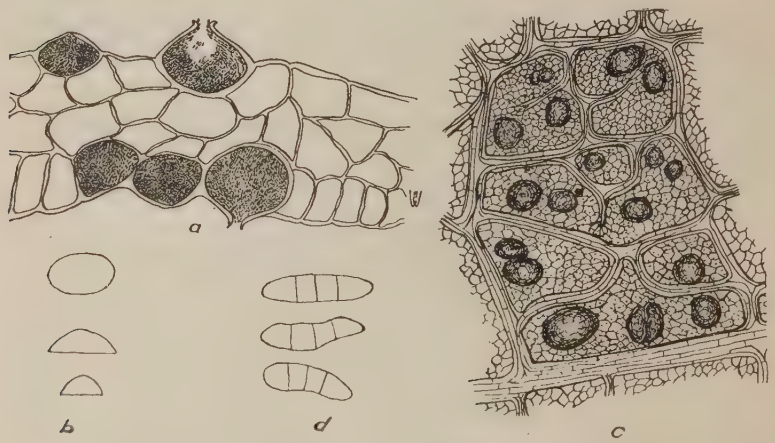


FIGURE 28.—Pycnidia and spores: *a*, of *Phyllosticta colocasiophila*—section showing pycnidia; *b*, of *Harknessia gunnerae* (No. 1143*a*) on *Gunnera petaloidea*—spores as seen from three different viewpoints.—*c-d*, of *Stagonospora erythrinae* (No. 1019) on *Erythrina monosperma; e*, pycnidia within the areolae between veins; *d*, three spores showing shape and septation.

The spots on the leaves vary from 1 cm. or less in diameter to large irregular regions occupying the major portion of the leaf surface. The younger spots are buff; the older are dark brown, and about them are pale marginal zones some 3-4 mm. wide. The diseased area becomes rotten, and frequently the centers of the spots drop out. In the regions not entirely rotted away, concentric circles of lighter and darker shades are seen. The veins do not limit the spreading of the fungus, the spot of which freely crosses them. The spots are visible equally well from both sides of the leaf. Leaves heavily infested become yellowish over their whole area, and fall to pieces because of the rotting of so many areas of their surfaces. Leaves with only one or two spots are still green, and the rotten areas are bounded by a pale green ring. The pycnidia, though amphigenous, are more abundantly hypophyllus than epiphyllous, and are gregarious. Sections show them to be thin-walled, and to lie just beneath the epidermis. The

conidiophores were not seen. Very rarely large spores with one septum are seen.

Two other phyllostictas have been reported on Colocasia. Von Höhnel (87, vol. 116, p. 142, 1907) reports that *P. colocasiacola* does not form spots on the leaf. It is described as having pycnidia 100-120 μ in diameter, and the spores 10 by 5-6 μ, and with short conodiophores. Von Höhnel (op. cit.) states that *P. colocasiae* produces amphigenous brown spots with furrowed zones, 3-7 mm. in diameter; spores are 3-4 by 1 μ with short conidiophores. The present species is quite obviously distinct from both of these in character of spots and in spore dimensions, and it is therefore proposed as a new species.

The ability of this Phyllosticta to cause distinct rotting of leaf tissue, a rot in character much like the soft rots caused by bacteria, is especially noteworthy, since such rotting is not commonly caused by either Phyllosticta or Phoma.

A Cladosporium is also present on the diseased leaves, causing dark brown, regular spots, 2-16 mm. in diameter; visible from both sides of the leaf. (See the dark circular spots in fig. Pl. x, *F*.) The conidiophores are brown, 50-180 μ by 8 μ, swollen at the tip. Spores brown, one or two-septate or non-septate, not catenulate, 14-21 by 7-10 μ, 3 guttulate.

No. 256. **Phyllosticta draconis** Berk. Hedwigia, vol. 35, p. 47, 1896

On living leaves of *Dracaena draco*. Oahu: Nuuanu valley, Sept. 14, no. 1168.

No. 257. **Phyllosticta erechtitis** Stevens and Young n. sp.

Spots irregular, 0.25-2 cm. in diameter, white to brown, margin slightly raised and white or indistinct. Pycnidia mainly epiphyllous, 65-175 μ in diameter, black; not numerous in a single spot. Ostiole definite. Conidia hyaline or slightly green tinted, oval, 4-7 μ by 1.5-2 μ ends obtuse, straight or slightly curved, with guttulae in each end.

On living leaves of *Erechtites sp*. Kauai: Waimea, June 15, no. 543.

No. 258. **Phyllosticta hawaiiensis** Caum. Haw. Pl. Rec. vol. 20, p. 278, 1919

"Parasitic in the leaf sheath and rind of the sugar cane (*Saccharum officinarum*) in Hawaii."—Caum.

No. 259. **Phyllosticta heliconiae** Stevens and Young n. sp.

Spots large, 15 cm. or more in diameter, white to brown with concentric lines towards edge, margin irregular, distinct, brown. Pycnidia epiphyllous in central part of spot, following in definite concentric lines, 110-175 μ in diameter, ostiole distinct. Conidia oval to ovate, 10-15 by 4-5.5 μ, ends mostly acute.

On living leaves of *Heliconia sp*. Oahu: Hakipuu, June 19, no. 574.

No. 260. **Phyllosticta marantaceae** P. Henn. Fungi Amaz. IV. Hedwigia, vol. 44, p. 69, 1905

On living leaves of *Maranta dichotoma.* Oahu: Honolulu, May 22, no. 51, and May, 1919, Lyon specimen.

The characters of the specimen examined differ slightly from the description of the above species in that the ostiole does not protrude, the pycnidia are larger, and the spot covers the whole end or side of a leaf.

No. 261. **Phyllosticta musae** Stevens and Young, n. sp.

No definite spot produced. Pycnidia very numerous, black, erumpent, mostly epiphyllous, scattered singly or in groups of two or more, often fused, 50-225 μ in diameter, ostiole small, distinct. Conidia hyaline, straight or sometimes curved, elongate, guttulate, 10-18 by 2-2.5 μ, tapering toward the ends which are blunt.

On living leaves of *Musa sp.* (banana). Oahu: Honolulu, Manoa valley, May 24, no. 76.

Phyllosticta musae differs from *Phyllosticta musicola* in that the former produces no distinct spots and the spores are longer and have blunt ends. It differs from *Phoma musae* Carpenter in that the spores of the Phoma are oval and have a gelatinous coat.

No. 262. **Phyllosticta musicola** Stevens and Young n. sp.

Spots very large, nearly white, margin irregular, brown or black, not raised. Pycnidia epiphyllous, scattered thickly near margin, 130-225 μ in diameter, ostiole distinct. Conidia 5-9 by 2-2.5 μ, ends mostly acute.

On living leaves of *Musa sp.* (banana). Oahu: Honolulu, May, 1919, Lyon specimen.

No. 263. **Phyllosticta nerii** West. Kick. J. Flore Crypt. d. Flandr. vol. 1, p. 148, 1867

On *Nerium oleander.* Oahu: Honolulu, May 19, no. 24. The spots deviate somewhat from the description as published and the spores are not guttulate, yet they agree so closely in size that I refer the specimen to the above mentioned species.

No. 264. **Phyllosticta pithecolobii** Esther Young, Mycologia, vol. 7, p. 145, 1915

On living leaves of *Pithecolobium saman.* Hawaii: Kukuihaele, August 2, no. 1104.

No. 265. **Phyllosticta pothicola** Amy G. Weedon n. sp.

Spots irregular, 3-4 cm. in diameter, or by coalescing 5 by 2.5 cm., light brown, surrounded by a sharply demarcated margin. Pycnidia arranged in concentric rows, amphigenous, sub-epidermal, dark brown, ostiolate, 216-277 μ in diameter. Spores hyaline, thick walled (1-1.8 μ), granular, continuous, irregular, oblong or ovate, 18-25 by 9 μ.

On *Pothos sp.* Oahu: Waikiki, May 18, no. 3; Honolulu, May 20, no. 25.

No. 266. **Phyllosticta scaevolae** El. and Ev. Bull. Torr. Bot. Cl. vol. 22, p. 436, 1895

On *Scaevola chamissoniana,* Heller's collection.

No. 267. **Phyllosticta cordylinophila.** P. A. Young n. sp.

Spots circular, 1-7 mm. in diameter (mostly 2-4 mm.), brown with raised, definite, dark, red-black margin, surrounded by a brown or purple, discolored area. Pycnidia black, amphigenous, 90-160 μ in diameter, generally fewer than 25 in one spot; ostiole small but definite. Conidia hyaline, 7-11 μ by 5-7 μ, dilute chlorine colored.

On living leaves of *Cordyline terminalis* (the Hawaiian ti plant). Oahu: Haw. Sugar Planters' Sta., Sept. 1921, no. 1132 (type); Honolulu, Manoa valley, May 23, no. 63; Honolulu Aug. 18, no. 1133.

Saccardo in his "Sylloge Fungorum," gives three species of Phyllosticta on Cordyline, none of the descriptions of which agrees with *P. cordylinophila* 1. *P. cordylines* Sacc. & Berl. differs in that the spots are vague, becoming pale, pycnidia crowded, epiphyllous; spores oblong, 2 guttulate, 4-5 μ by 1 μ, hyaline; *P. maculicola* Halst. differs in that the spots have pale centers and red to purple margins surrounded by yellow areas; spots larger than those of *P. cordylinophila; P. draecenae* differs in that the spores are 5-7 μ by 2-2.5 μ, pycnidium with protruding pore.

No. 268. **Phyllosticta zingiberis** Stevens and Ryan, n. sp.

Spots large, white, margin irregular, brown, not raised. Pycnidia epiphyllous, gathered near the center of the spot, 114-125 μ in diameter, ostiole distinct.

On leaves of *Zingiber zerumbet.* Oahu: Olympus, June 24, nos. 655 and 961. Hawaii: Kealakekua, July 23.

111. PHOMA Fr. emend Desm. Notice sur Pl. Crypt. de France 13, p. 6, in Ann. Sc. Nat. Paris, Emend Saccardo Mich. vol. 2, p. 4, 1880

No. 269. **Phoma agapanthi** (Thüm) Sacc. Syll. Fung. vol. 3, p. 158, stel., 1884

Sphaeropsis agapanthi Thüm Contr. Myc. Lusit. no. 319.

On dying leaves of *Agapanthus umbellatus.* Hawaii: Kealakekua, July 21, no. 927.

The size of conidia of the fungus on the specimens examined agreed closely with those in the printed description. Pycnidia 90-800 μ in diameter, deeply immersed, erumpent, with rather long, papillate ostiole. A black mycelium radiates from the pycnidia.

No. 270. **Phoma barringtoniae** Cooke and Mass. Grevillea. vol. 17, p. 79, 1889

On living leaves of *Barringtonia asiatica.* Oahu: Honolulu, Hillebrand garden, June 22, no 42. On fruit. Oahu: Honolulu, Hillebrand garden, June 22, nos. 55 and 56.

The pycnidia, which were densely gregarious in spots with indistinct margins, were 100-160 μ in diameter, subepidermal and globose.

No. 271. **Phoma henningsii** Sacc. Syll. Fung. vol. 10, p. 139, 1892

Phoma acaciae P. Henn. Fungi Africani, p. 368, 1891.

Spots gray or not discolored, 0.5-3 mm. in diameter, margins indistinct. Pycnidia black, very numerous, 35-125 ü in diameter, subepidermal, ostiole definite. Conidia 3-7 μ by 2-3 μ, hyaline or green tinted, eguttulate, oval.

On dead pods of *Albizzia lebbek.* Oahu: Honolulu, May 19, nos. 21 and 38.

Slight differences which may be noted between this fungus and *P. henningsii,* as described, do not warrant the erection of a new species.

No. 272. **Phoma herbarum** West. Exs. 965, Consp. gen. fung. Ital. Michelia vol. 2, p. 92, 1880

On *Stachytarpheta dichotoma.* Hawaii: Keauhou, Kona, Bishop Estate road, July 23, no. 934; Kukuihaele, August 2, no. 1106.

No. 273. **Phoma macularis** Desm. 22, not. p. 7, op. cit.

On dead stems of *Hibiscus sabdariffa.* Hawaii: Honolulu, Apr. 21, 1913, Lyon no. 321.

This fungus is apparently a saprophyte and is placed tentatively in the above species. The characters of this specimen were: Pycnidia numerous, scattered, conidia fusiform, 6-10 by 2-2.5 μ.

No. 274. **Phoma musae** Carpenter, Hawaii Agr. Expt. Sta. Rept. 1918, pp. 36-40.

On living leaves of *Musa sp.* (banana). Oahu: Honolulu, Manoa valley, May 24, no. 76. Reported also by Carpenter (29, Rept. 1920).

Spores of this fungus were found on only one leaf of the many collected. The rest of the mature pycnidia found on the banana leaves contained the elongate spores of *Phyllosticta musae,* S. & Y.

112. MACROPHOMA (Sacc.) Berl. and Vogl. Atti. Soc. Veneto-Trentina, p. 172, 1886

No. 275. **Macrophoma smilacina** (Pk.) Berl. and Vogl. op. cit.

Sphaeropsis smilacina Pk. Rept. 33, p. 24, N. Y. St. Mus. 1880.

Phoma smilacina Pk. Sacc. Syll. Fung. vol. 3, p. 160, 1884.

On *Smilax sandwicensis.* L. D. Larsen, Kaala, 1913, Larson no. 32.

No. 276. **Macrophoma cattleyicola** P. Henn. Hedwigia, vol. 44, p. 173, 1905

On leaves of *Cattleya sp.* Oahu: Honolulu, May 23, no. 73.

This fungus resembles a Phyllosticta. However, since it is probably saprophytic and agrees in spore size with *Macrophoma cattleyicola* it is placed tentatively in this species.

113. DENDROPHOMA Sacc. Mich. vol. 2, p. 4, op. cit.

No. 277. **Dendrophoma gouldiae** Stevens and Plunkett, n. sp.

Spots irregular, brown or white, 3-6 mm. in diameter, margin raised, red or black. Pycnidia numerous, scattered, epiphyllous, glóbose, black, 112-170 μ in diameter, ostiole distinct. Spores hyaline, oblong, with obtuse ends, 14-20 μ by 2.5 μ. Conidiophores hyaline, simple or with two or three branches, 12-20 μ by 2-3 μ.

On living leaves of *Gouldia coriacea.* Kauai: Kalalau trail, June 16, no. 499.

114. CICINNOBOLUS Ehrenb. Bot. Zeit. vol. 11, p. 16, 1853

No. 278. **Cicinnobolus cesatii** de Bary Morph and Phys. d. Pilze, p. 71, 1866

On mildew on *Verbena sp.* (cult.). Oahu: Round Top, Lyon no. 334, 1913.

115. FUSICOCCUM Corda In Sturm Crpt. Fl. vol. 2, p. 111, 1829

No. 279. **Fusicoccum canavaliae**

On *Canavalia ensiformis.* Reported by Lyon (115, vol. VIII, p. 288, 1913). Author of the species and place of publication not given.

SPHAERIOIDACEAE—PHAEOSPORAE

116. CONIOTHYRIUM Corda Icon. vol. 4, p. 38 emend, Sacc. Mich. vol. 2, p. 7, 1840

No. 280. **Coniothyrium dracaenae** Stevens and Weedon n. sp.

Young spots red with yellowish centers, older regions white, both bordered by heavy, dark, red lines; visible from both sides of leaf, 8-10 by 12-20 mm., or by coalescing forming irregular regions 10 by 2 cm. or larger. The diseased areas extend from 5 mm. to 2 cm. beyond the pycnidia. Pycnidia dark brown, 108-288 μ in diameter, sub-epidermal, amphigenous. Spores olive brown, unicellular, ellipsoid, 3-5 by 2-3 μ, obtuse. Associated with *Leptosphaeria dracaenae* (see p. 106).

On *Dracaena aurea.* Kauai: Pipe trail, upper Waimea canyon, June 15, no. 419a (type).

117. HARKNESSIA Cooke Grev. vol. 9, p. 85, 1881

No. 281. **Harknessia gunnerae** Stevens and Young, n. sp.

Spots very large, tan colored, circular in outline, rotten, bordered by a yellow band about 5 mm. wide. Pycnidia hypophyllous, 100-170 μ in diameter, in the mesophyll, opening irregularly. Conidia brown, 9-14 by 5-7 μ, oval flattened.

On living leaves of *Gunnera petaloidea.* Maui: Olinda pipeline, Sept. 5, no. 1143a.

This fungus produced large rotten regions in the leaf, which were densely set with black spots; these on microscopic examination proved to be masses of spores overflowed from the colorless pycnidia. The shape of the spore is characteristic and unique. From one viewpoint it is elliptical, while in other views it is as is shown in Figure 28, *b*.

No. 282. **Harknessia hawaiiensis** Stevens and Young, n. sp.

Spots brown, very large, up to 12 by 4 cm., margin irregular, sharp, brown, raised. Pycnidia hypophyllous, scattered, 225-250 μ in diameter, rupturing irregularly. Conidia mostly sphaerical or slightly oval, brown, thick-walled, often guttulate, 7-11 μ in diameter.

On living leaves of *Eucalyptus robusta.* Oahu: Waipio, July 1, 1919, Lyon no. 124.

This fungus is distinct from *Harknessia eucalypti,* Cke., which has cylindrical, pointed conidia twice as large as those of *H. hawaiiensis.*

118. SPHAEROPSIS Lév. in Fung. in Demidov Voyage, p. 112, 1842

No. 283. **Sphaeropsis gouldiae** Stevens and Plunkett n. sp.

Pycnidia numerous, hypophyllous, superficial, black, ostiolate, globose, 96-180 μ in diameter. No aerial mycelium. Spores dark brown, one-celled, oval to oblong, 14-18 by 7-11 μ.

On living leaves of *Gouldia sp.* Hawaii: Kohala Mt., Waimea, Sept. 1911, Forbes no. 500.

This fungus in all respects, with the exception of being superficial is a Sphaeropsis, therefore it has not been thought necessary to make a new genus to account for this single character.

SPHAERIOIDACEAE—HYALODIDYMAE

119. DARLUCA Cast. Cat. Pl. Marséille Suppl. p. 53, 1851

No. 284. **Darluca filum** (Biv.) Cast.

On *Uromyces leptodermus* on *Panicum barbinode.* Oahu: Wahiawa, May 31, no. 162.

On *Puccinia versicolor* on *Heteropogon contortus.* Oahu: Tantalus, May 23, 1909, Lyon no. 94.

On *Uromyces rhyncosporae* on *Rhynchospora lavarum.* Oahu: Kalihi valley, June 2, no. 170.

There are only 13 species of Darluca described in Saccardo's Sylloge Fungorum, setting aside the species with more than 1 septum namely: *Darluca interseminata,* and *Darluca arcuata,* and also *Darluca genistalis,* because no spore measurements of this species are given. The remaining species may be separated into three groups based on spore length.

Group I consists of two species: *Darluca longisita* and *D. ammophila,* with spores about 30 μ long.

Group II consists of three species: *Darluca bubakiana, D. australis,* and *D. ascochytoides,* with spores ranging up to 18 μ or longer.

Group III consists of five species: *Darluca mucronulata, D. sorghi, D. bivonae,* and *D. australis,* var. *phyllostictoides,* and *D. filum,* which fall very closely together in spore measurements and in all other characters, ranging from 12 to 16 μ in spore length.

The spore measurements of the Darluca on *Uromyces leptodermus* were 13-16 by 3.6-5.4 μ; of the Darluca on *Puccinia versicolor* 12-13 by 3.5-4 μ. The species on *Uromyces rhyncosporae* afforded no spores, although pycnidia were observed which resemble the pycnidia of the other two specimens examined. In the absence of evidence to the contrary, this specimen is reported as being of the same species as the other two. It thus appears that four species agree closely in description with our specimens which we report under the name *D. filum,* though recognizing that determination as either of the three would perhaps be equally tenable.

SPHAERIOIDACEAE—PHAEODIDYMAE

120. DIPLODIA Fries. Summa Veg. Sand. p. 416, 1849

No. 285. **Diplodia opuntiae** Sacc. Mich. vol. 2, p. 267, op. cit.

On *Opuntia sp.,* C. W. Carpenter (39, Rept. 1918).

SPHAERIOIDACEAE-HYALOPHRAGMIAE

121. STAGONOSPORA Sacc. Mich. vol. 2, p. 267, op. cit.

No. 286. **Stagonospora erythrinae** Stevens & Young, n. sp.

No typical spot produced. Pycnidia in the mesophyll, amphigenous, scattered singly or in groups, limited to spaces between veinlets, globose, 100-160 μ. Conidia very abundant, 1-3 septate, granular, 25-40 μ by 5-7 μ, sticky, adhering in dark masses on the leaf. (See fig. 28, *c, d.*)

On dead leaves of *Erythrina monosperma.* Hawaii: between Kona and Waimea, July 27, no. 1019.

SPHAERIOIDACEAE—PHAEOPHRAGMIAE

122. HENDERSONIA Berk. Supp. p. 208. t. xi, *f, g.*

No. 287. **Hendersonia nitida** El. and Ev. Bull. Torr. Bot. Cl. vol. 22, p. 436, 1895

On *Myrsine sp.* Heller's collection no. 2305.

SPHAERIOIDACEAE—SCOLECOSPORAE

123. SEPTORIA Fr. Syst. Myc. vol. 3, p. 480, 1829
Emend. Sacc. Mich. vol. 2, p. 6, 1880

No. 288. **Septoria bataticola** Taub. Phytop., vol. 4, p. 320, 1914

On sweet potato. Hawaii: Hamakua, 1917, C. W. Carpenter (29, Rept. 1917).

No. 289. **Septoria canavaliae** Lyon in Sydow Fung. Exot. no. 191,[21] 1913

On Canavalia (cult.) Oahu: Honolulu, H. S. P. A. nursery, May 22, no. 32; also Lyon no. 264, 1913.

No. 290. **Septoria cerastii** Rob. and Desm. Not. 17, p. 21, in Ann. d. sc. Nat. vol. 11, p. 21, 1849; and Sacc. Mich. vol. 1, p. 260

On *Cerastium sp.* Oahu: Nuuanu Pali, May 27, nos. 116a and 543.

No. 291. **Septoria clermontiae** Stevens and Young, n. sp.

Spots irregular, 1-7 mm. in diameter, margin brown, raised. Pycnidia subcuticular, erumpent, black, shining, epiphyllous, 55-145 μ in diameter. Conidia 1-2 septate, 10-20 μ by 1 μ, hyaline, slightly curved, ends acute.

On living leaves of *Clermontia sp.* Oahu: Tantalus, June 22, no. 659.

On *Clermontia kakeana* (?). Oahu: Tantalus, May 25, no. 98.

No. 292. **Septoria gouldiae** Stevens and Young, n. sp.

Leaf-spots definite, surrounded by a sharp, black line, raised above the surface on both sides of the leaf, the discoloration extending about 1 mm. away from the lines. Spots one to several on each leaf, center brown to white, 3-5 mm. in diameter. Pycnidia in mesophyll of leaf, 90-115 μ in diameter, slightly or not at all erumpent, opening on upper surface of leaf, numerous and scattered, most abundant at edges of spots. Spores filiform, hyaline, 50-90 μ by 2 μ, curved, ends obtuse, no septa seen.

On living leaves of *Gouldiae lanceolata.* Oahu: Tantalus, June 22, no. 602. Also no. 613.

On *Kadua grandis.* Oahu: Tantalus, May 29, no. 93.

[21] The type material of this fungus was sent by Lyon to Sydow in a letter, with a suggestion as to name. The description was made and published by Sydow in his Fungi exotica exsiccati.

Saccardo gives no species of Septoria on Gouldia, though there are 14 species occurring on the Rubiaceae. The spores of *S. gouldiae* are larger than any of those with two exceptions: (1) *S. melandrii Pass. var. andrijevicensis* on *Melandryum nemoralis* reported from Montenegro, which is unlike *S. gouldiae* in that the spores of the former are 60-82 μ long and with 1-6 transverse septa; (2) *S. romana* D. Sacc. in leaves of *Sherardia arvensis,* reported from Rome, which is unlike *S. gouldiae* in that its pycnidia are hypophyllous, erumpent, 90-120 μ in diameter, and the spores are straight or subundulate, many nucleated, acute at both ends, and 100 μ by 2-3 μ (generally 60-75 μ).

Perithecia indistinguishable superficially from the pycnidia (see p. 104) were found on the spots and the two may be connected.

No. 293. **Septoria graminum** Desm. Ann. Sc. Nat. ser. 4, vol. 18, p. 339, 1843

In Heller's collection.

No. 294. **Septoria poa-trivialis** Cocconi Mem. R. Acc. Bologna p. 153, 1896

On *Poa annua.* Hawaii: Kilauea, July 16, no. 859.

The present fungus is found on *Poa annua* and although it varies somewhat from the brief description given by Saccardo (165, vol. 14, p. 980), since it agrees in host it is considered as the same fungus. The measurements in this case were found to be both shorter and longer than the original, and ranged from 0.7-1.2 μ wide.

No. 295. **Septoria hawaiiensis** Stevens and Plunkett, n. sp.

Spots irregular, 1-3 mm. in diameter, dark. Pycnidia epiphyllous, subcuticular, erumpent, shining, 25-40 μ in diameter. Conidia guttulate, 14-18 by 2-2.5 μ, hyaline, straight, ends obtuse.

On living leaves of *Gouldia sp.* Hawaii: Kohala Mts., Waimea, September, 1911, Forbes no. 500.

No. 296. **Septoria lycopersici** Speg. Fung. Argent. Pug. 4, 1882

On *Lycopersicum esculentum* (tomato). Oahu: Wahiawa, nos. 212 and 289, 1918. C. W. Carpenter (29, Report 1917), also no. 173, 1917, Honolulu.

No. 297. **Septoria apii** Chester, Bul. Torr Bot. Cl. vol. 18, p. 371, 1891.

On *Apium graveolens* (celery). Oahu: Wahiawa, Lyon 1918; L. D. Larsen, Luakaha, 1913, Lyon no. 28. Hawaii: Glenwood, C. W. Carpenter; Volcano House, Carpenter no. 92, 1917.

No. 298. **Septoria rostrupii** Sacc. & Syd., Sacc. Syll. Fung. vol. 14, p. 973, 1890

Septoria chrysanthemum. E. Rostrup, Bot. Tidsskr., p. 48, 1897.

On *Chrysanthemum indicum*. Oahu: Honolulu, June 4, no. 273. Hawaii: Kealakekua, July 22, no. 929.

The description of this species as given in the Sylloge Fungorum is as follows: "Spots orbicular, epiphyllous, cirri white, slender; spores filiform, subflexuous, 40-50 by 2 microns."

The fungus of collection no. 273 is as follows:

Spots brown, irregular, 0.5-2 cm. long by 0.5-1 cm. wide. Pycnidia epiphyllous, dark colored, 45-70 microns in diameter, ostiole definite. Spores 15-40 by 2-3 μ, 1-3 septate, green tinted, straight or slightly curved, ends acute.

Although our specimen differs from the description given by Saccardo in that the spores of the latter are shorter and thicker, green tinted, and septate, it is not thought best to give this fungus a new specific name.

No. 299. **Septoria rollandiae** Stevens and Young, n. sp.

Leaf spots definite, surrounded by a white-brown line, 5-20 mm. in diameter. Pycnidia numerous in center of spot, opening on both surfaces of the leaf, subepidermal, 55-110 microns in diameter; ostiole definite. Spores extruded in yellow cirri, hyaline or slightly green tinted, straight or slightly curved, 7-16 (generally 9-14) microns by 1-1.5 microns, 1-2 septate and without guttulae, or 3-5 guttulate and with no septa, and with one end of spore wider than the other; ends mostly acute. (See Pl. x, *D*.)

On leaves of *Rollandia crispa*. Oahu: Olympus, June 24, no. 706.

Saccardo gives 11 species of Septoria the spore lengths of which agree approximately with that of the above species. However, their host genera are not of the Lobeliaceae. He gives 10 species on 5 genera of the Lobeliaceae, in only two of which are the spore lengths near those of the above species. These are: (1) *S. lobeliae* Peck. which differs from *S. rollandiae* in that the spores of the latter are shorter and the margin of this spot is light colored. (2) *S. phyteumatis* Siegm. which differs from *S. rollandiae* in that the spores of the latter are shorter than those of the former.

Septoria rollandiae is of special interest because it causes a rotting of leaf tissue. The pycnidia are borne only near the centers of the spots. This fertile area is surrounded by a region which is at first translucent and rotten. Later the fertile part falls out, and finally the whole of the involved area drops out, leaving a hole.

No. 300. **Septoria salviae-pratensis** Pass. Fung. Gall. novi in Jour. d' Hist. Nat. No. 4, p. 16, 1885

On living leaves of *Salvia coccinea*. Maui: Iao valley, Sept. 7, no. 1153.

The description of the material examined differs slightly from the printed description in that the conidia are 25-40 by 2 μ and the pycnidia are one or few in each spot. Further characters not given by Passerini are:

spots gray or white, 0.5-2 mm. in diameter; margin raised, pycnidia epiphyllous, 35-80 μ in diameter; conidia few-septate.

124. RHABDOSPORA Mont. in Fl. Alg. Bot. p. 592. Emend. Sacc. Mich. vol. 2, p. 26, 1880

No. 301. **Rhabdospora pittospori** Stevens & Young n. sp.

Pycnidia numerous, black, 400-800 μ in diameter, ostiole large. Conidia abundant, filiform, hyaline, straight or curved, obtuse, 1 to few-septate, 12-22 by 2 μ, conidiophores 15-18 μ long.

On dead capsules of *Pittosporum sp.* Hawaii: Kona, July 23, 1911, collected by C. N. Forbes, no. 21.

125. CLYPEOSEPTORIA Stevens and Young, n. gen.

Pycnidia clypeate. Conidia filiform.

No. 302. **Clypeoseptoria rockii** Stevens and Young, n. sp.

Spots 2-5 mm. in diameter, white-brown, entire spots raised 0.5 mm. above upper surface of leaf; margin brown, indistinct. Pycnidia with a heavy black clypeus, subepidermal, epiphyllous, irregular, 135-225 μ in diameter; ostiole definite. Conidia hyaline, variously curved, 90-125 μ by 0.75-1 μ, filiform, continuous, ends tapering, but obtuse. (See fig. 29.)



FIGURE 29.—Pycnidia of *Clypeoseptoria rockii* (Lyon no. 286) on *Platydesma campanulata*, each covered by a clypeus.

On living leaves of *Platydesma campanulata.* Maui: Honomanu, May, 1911, J. F. Rock, Lyon no. 286.

The pycnidia, in the possession of a thick covering, show some resemblance to the imperfect stage of *Dothidella flava* Stevens (180, vol. 69, p. 250, 1920). They are often angular and somewhat irregular, and typically are not globose. The wall, except that portion occupied by the

clypeus, is thin and light colored. The clypeus is composed of black hyphae which fill the epidermal cells over the spore cavity. Extensive mycelium was seen in the leaf tissues. This genus resembles Septoria in its spores, but differs from it in other characters.

126. PHOMOPSIS Sacc. Ann. Myc. vol. 3, p. 166, 1905

No. 303. **Phomopsis achilleae** (Sacc.) v. Höhn Fr. 3, Myk. in Sitz. d. k. Akad. Wissen. in Wien. vol. 115, p. 32, 1906

On dead stems of *Dahlia sp.* Oahu: Honolulu, Sept. 18, 1913, Lyon no. 378.

On *Hemerocallis sp.* Hawaii: Kukuihaele, August 2, no. 1094.

No. 304. **Phomopsis vexans** (Sacc. and Syd.) Harter Jour. Agr. Res., vol. 2, p. 338, 1914

Phoma vexans. Sacc. and Syd., Syll. Fung. vol. 14, p. 889, 1890.

On *Solanum melongena* (egg plant). Oahu: Wahiawa, 1918, C. W. Carpenter (29, Rept. 1918) no. 211.

NECTRIOIDACEAE

127. ASCHERSONIA Mont. Syll. Cryt. no. 929

No. 305. **Ascheronsia marginata** E. and E. Bull. Torr. Bot. Cl. vol. 22, p. 436, 1895

On *Psidium* in Heller's collection as reported by Ellis.

LEPTOSTROMATACEAE

Conidia hyaline.....128 **Leptothyrium**
Conidia dark.....129 **Pirostoma**

128. LEPTOTHYRIUM Kunze and Schm. Mykol. hefte allgembot. Anz. p. 79—emend Sacc. Mich. vol. 2, p. 114, no. 955, 1880

No. 306. **Leptothyrium sidae** Stevens and Young, n. sp.

Spots mostly white, 2-5 mm. in diameter, margin brown, raised, definite. Pycnidia numerous in concentric circles (often attached in groups of 2 or 3), amphigenous (mostly epiphyllous), light brown, dimidiate, 60-150 μ in lateral diameter, opening by tearing off the covering membrane. Conidiophores simple, borne in a flat basal layer. Conidia elongate-oval, continuous, hyaline (or ochraceous)) 6-9 by 2 μ with guttulae in the ends. (See fig. 30, *a, b.*)

On living leaves of *Sida spinosa.* Hawaii: Kealakekua, July 21, no. 912; Maui: Iao valley, Sept. 7, no. 1152.

A few immature, subepidermal pycnidia of very different character, with definite ostioles, were found in one of the spots bearing the *Leptothyrium*.

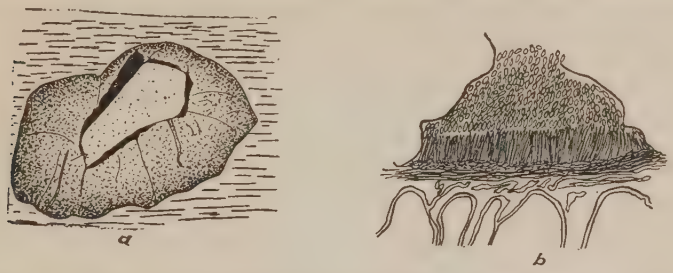


FIGURE 30.—Pycnidia of *Leptothyrium sidae* (No. 912) on *Sida spinosa: a*, view from above; *b*, section showing spores.

No. 307. **Leptothyrium pothi** Amy G. Weedon n. sp.

Spots definite, irregular in shape, 0.5 by 1 cm. to 8 by 3 cm., or by coalescing occupying almost half of the leaf area, limited by the mid-rib, visible from both sides of the leaf, ashy to white. Pycnidia more abundant near the edge of the spot, gregarious, in areas about 2 by 5 mm. to 8 mm. in diameter, arranged in a somewhat concentric manner; hypophyllous, black, subepidermal, 133-180 by 136-198 μ. Ostiole lacking, but the pycnidial cover thin at the center. Spores hyaline, with two large guttulae, almost filling the spore, occasionally found with many small guttulae, continuous, oblong, a trifle broad at one end, and slightly pointed at the other, 14-16 by 7 μ.

On *Pothos sp.* (cult). Oahu: Honolulu, May 20, no. 26; Hawaii: Kapapala ranch, July 18, no. 883 (type).

This species appears clearly to belong to the genus Leptothyrium, though the pycnidial covering under the cuticle is very thin, and the whole structure with merely superficial study might readily pass for an acervulus.

No. 308. **Leptothyrium gleicheniae** Stevens and Young n. sp.

Spots brown or black, 2-10 by 2-4 mm. in diameter. Pycnidia epiphyllous, black, subepidermal, inconspicuous, 225-600 μ wide, 35-55 μ thick. Conidia oval or oblong, hyaline, 1-celled, 2-3 by .7-1 μ.

On living leaves of *Gleichenia longissima*. Oahu: Wahiawa, May 31, no. 153.

On *Gleichenia sp.* Maui: Pogue's ditch trail, Sept. 6, no. 1158.

129. PIROSTOMA Fries. Summa Veg. Syst. vol. 2, p. 395, 1849

No. 309. **Pirostoma dianellae** Stevens and Young n. sp.

Spots light colored, indefinite. Pycnidia hypophyllous, dimidiate, dark colored, closed at first, later rupturing by large, oval or lacerate opening, mostly scattered,

200-700 μ in diameter. Mycelium dark. Conidia 1-celled, olivaceous, oval, 6-10 by 2-3 μ, ends rounded or slightly acute.

On leaves of *Dianella odorata.* Hawaiian Islands, 1921.

Melanconiales

KEY TO HAWAIIAN GROUPS

Conidia hyaline, 1-celled	**Hyalosporae**
Conidia dark, 1-celled	**Phaeosporae**
Conidia hyaline, several-celled	**Hyalophragmiae**
Conidia dark, several-celled	**Phaeophragmiae**

HYALOSPORAE

130. GLOEOSPORIUM Desm. and Mont. in Ann. Sc. Nat. Ser. 5, vol. 4, p. 295, 1849

No. 310. **Gloeosporium affine** E. and K. in jour. Myc. vol. 1, p. 113, 1885
In Heller's collection.

No. 311. **Gloeosporium barringtoniae** Stevens and Young n. sp.
No distinct spot formed. Acervuli scattered along veins or grouped in circular areas, white, 100-200 μ in diameter. Conidia oblong, non-septate, 11-18 by 3-3.5 μ.

On living leaves of *Barringtonia asiatica.* Oahu: Hillebrand gardens, Honolulu, June 18, no. 42.

No. 312. **Gloeosporium canavaliae** Sydow, Fung. Exot. no. 145.
On *Canavalia sp.* (cult.) Reported by Lyon (115, vol. 8, p. 287, 1913).

No. 313. **Gloeosporium cerei** Passer. Diagn. d. Funghi nuovi. No. 47, 1891
On *Cereus sp.* Oahu: Honolulu, June 5, no. 262.
The description of the material examined differs slightly from the printed description in that the acervuli are mostly linear and not flexuose, and that the spots are dark.

No. 314. **Gloeosporium musarum** Cooke and Mass. Grev. vol. 16, p. 3, 1887
On living leaves of *Musa* (banana). Oahu: Hakipuu, June 19, no. 565.

No. 315. **Gloeosporium peleae** Stevens n. sp.
Acervuli numerous, dark, 90-110 μ in diameter, subcuticular, erumpent. Conidia hyaline, 1-celled, 11-16 by 4 μ, obtuse at one end and usually tapering at the other.

On galls caused by the psyllid *Hevaheva perkini* on Pelea. Oahu: Tantalus, June 22, no. 632.

The spores, somewhat variable in size and of quite characteristic shape, as well as the unique habitat, are distinctive.

No. 316. **Gloeosporium** sp. A "Gloeosporium-like fungus" is also reported by C. W. Carpenter (29, Rept. 1918).

On *Persea gratissima* (avocado), *Musa cavendishii* (banana), cassava, *Coffea sp.* (coffee), fig, *Psidium guayava* (guava). *Litchi chinensis* (litchi), *Mangifera sp.* (mango), star-apple and vanilla.

131. COLLETOTRICHUM Corda in Sturm Cr. Flora, vol. 3, p. 41, 1837

No. 317. **Colletotrichum artocarpi** Delacroix. Bull. trim. Soc. Myc. de France, vol. 21, p. 198, f. 12, 1905

On living leaves of *Artocarpus incisa.* Oahu: Hakipuu, June 19, no. 576.

No. 318. **Colletotrichum dianallae** Stevens and Young n. sp.

Acervuli elongated with veins, brown to black, up to 1200 μ long and 100 μ wide, setae brown, 50-70 by 4 μ, ends acute. Conidia not numerous, 25-32 by 3-5 μ, straight or somewhat curved, ends acute.

On living or languid leaves of *Dianella odorata.* Kauai: Waimea Canyon, June 15, no. 447.

No. 319. **Colletotrichum dracaenae** Allesch. Rab. Krypt. Flora v. Deutsch, vol. 1, part 7, p. 560, 1903

On dead stems of *Agapanthus sp.* Hawaii: Waimea, July 30, no. 1039.

The characters of the fungus on this specimen agree fairly well with the printed description, yet, because of the fact that this fungus is a saprophyte and that the host genus is not known definitely, this determination is uncertain.

No. 320. **Colletotrichum falcatum** Went. Het. Rood. Snot, p. 7, 1893.

"A parasite in cane sticks. Hawaii." Caum.

No. 321. **Colletotrichum gloeosporioides** Penz. in Mich. vol. 2, p. 450, 1882

On *Citrus aurantium* (orange). Oahu: Honolulu, Lyon 1912; Wahiawa, Lyon no. 235, 1912.

No. 322. **Colletotrichum lindemuthianum** (S. and M.) B. and C. Hedwigia, vol. 22, p. 127, 1883

On *Phaseolus vulgaris* (bean). C. W. Carpenter (29, Rept. 1917, 1918 and Bul. 8).

No. 323. **Colletotrichium malvarum** (A. Br. and Casp.) Southw. Jour. Myc. vol. 6, p. 116, 1890

On living leaves of *Sida sp.* Hawaii: Kealakekua, July 21, no. 913.

The description of the material examined differs slightly from the printed description in that the setae are 20-65 by 4 μ long, and the conidia are 10-15 by 5-6 μ.

No. 324. **Colletotrichum passiflorae** Stevens and Young n. sp.

Acervuli black, numerous, 90-225 μ in diameter. Setae brown, 50-75 by 5 μ. Conidia granular, cylindrical, 10-18 by 3.5-6 μ.

On fruits of *Passiflora laurifolia.* Hawaii: Kealakekua, July 21, no. 914.

On living leaves of *Passiflora edulis.* Kauai: Pipe trail, June 15, no. 465.

A thin brown, mycelial plate is formed at the base of each acervulus.

No. 325. **Colletotrichum peregrinum** Pass. Diagn. d. Funghi nuovi IV, p. 14, 1890

On living leaves of *Nothopanax sp.* Oahu: Honolulu, Hillebrand garden. May 22, no. 40.

The spores from this specimen are a little larger than those described by Passerini.

No. 326. **Colletotrichum phyllocacti** E. & E. Jour. of Myc. vol. 8, p. 65, 1902

On living leaves of *Phyllocactus sp.* Oahu: Honolulu, Jan. 28, 1913, Lyon no. 260.

PHAEOSPORAE

132. MELANCONIUM Link. in Willd. Sp. pl. Fungi. Ed. 4, vol. 2, p. 91, 1810

No. 327. **Melanconium iliau** Lyon. Haw. Pl. Rec., vol. 3, p. 148, 1910

On *Saccharum officinarum* (cane).

"An imperfect form of *Gnomonia iliau* Lyon."—Caum.

No. 328. **Melanconium pandani** Lév. in Ann. Sc. nat. Bot. ser. 4, vol. 20, p. 66, 1845

On fruits of *Pandanus,* Lyon no. 5. Palmyra Island, collected by Joseph F. Rock (154), reported by H. L. Lyon.

No. 329. **Melanconium sacchari** Mass. Ann. Bot. vol. 7, p. 515, 1893.

On *Saccharum officinarum* (cane).

"Saprophytic or possibly very weakly parasitic in nearly all sugar-growing countries. Thought by Masse to be a form of *Trichosphaeria sacchari* Mass."—Caum.

HYALOPHRAGMIAE

133. SEPTOGLOEUM Sacc. Mich. vol. 2, p. 11, 1. c.

No. 330. **Septogloeum arachidis** Racib. Zeitsch. f. Pflanzenkr. vol. 8, p. 66, 1898

On *Arachis hypogaea* (peanut). C. W. Carpenter (29, Rep. 1918).

PHAEOPHRAGMIAE

134. PESTALOZZIA De Not. Micr. ital. novi vel. minus cog. no. 9, 1856

No. 331. **Pestalozzia sps.**

Numerous collections of this genus were made on the following hosts: *Antidesma platyphyllum, Baumea meyenii, Dianthus sp.* (cult.), *Acrostichum sp., Eucalyptus globulus, Eugenia malaccensis, Musa sp.* (cult.), *Vincentia angustifolia.*

MONILIALES

KEY TO FAMILIES AND GENERA

Conidiophores separate
- Conidiophores and conidia hyaline — **Moniliaceae**
 - Conidia 1-celled hyaline — **Moniliaceae-amerosporae**
 - Conidiophores much like the mycelium — **Oosporeae**
 - Mycelium within the host — 135 **Monillia**
 - Mycelium superficial — 136 **Oidium**
 - Conidiophores clearly different from the mycelium
 - Conidiophores but little branched — **Cephalosporieae**
 - Conidia straight — 137 **Trichoderma**
 - Conidia curved — 138 **Allantospora**
 - Conidiophores much branched — **Botrytideae**
 - Conidiophores not erect — 139 **Sporotrichum**
 - Conidiophores erect — 140 **Botrytis**
 - Conidia 3- to many-celled — **Moniliaceae-phragmosporae**
 - Conidia cylindric ovate — 141 **Ramularia**
 - Conidia obovate — 142 **Piricularia**
- Conidiophores and conidia both dark — **Dematiaceae**
- Conidia oxogenous
 - Conidia 1-celled — **Dematiaceae-amerosporae**
 - Conidiophores much like the mycelium — **Toruleae**
 - Conidiophores clearly different from the mycelium
 - Conidia not catenalate — **Trichosporieae**
 - Conidia catenalate — **Haplographieae**
 - Conidia 2-celled — **Dematiaceae-didymosporae**
 - Conidia 3- to many-celled — **Dematiaceae-phragmosporae**
 - Conidia solitary — 147 **Helminthosporium**
 - Conidia whirled — 148 **Acrothecium**
 - Conidia muriform — **Dematiaceae-dictyosporae**
 - Conidia filiform — **Dematiaceae-scolecosporae**
- Conidia endogenous — **Dematiaceae-endoconideae**

Conidiophores fascicled or tuberculate
- Conidiophores in a synema or coremium **Stilbaceae**
 - Conidia hyaline **Hyalostilbeae**
 - Conidia dark, 1-celled **Phaeostilbeae-amerosporae**
 - Conidia dark, several-celled **Phaeostilbeae-phragmosporae**
- Conidiophores in a sporodochium **Tuberculariaceae**
 - Hyaline, spores several-celled **Mucedineae-phragmosporae**
 - Dark, spores 1-celled **Dematieae-amerosporae**
 - Dark, spores muriform **Dematieae-dictyosporae**

MONILIACEAE-AMEROSPORAE

135. MONILIA Pers. Emend Sacc. Mich. vol. 2, p. 17, 1880, op. cit.

No. 332. **Monilia aureofulva** C. & E., in Grevillea, vol. 8, p. 12, 1879 Atkinson's list, Lyon no. 49a.

No. 333. **Monilia sitophila** (Mont.) Sacc. in Mich. vol. 2, p. 359.
On *Saccharum officinarum.* Lyon no. 109.
"A saprophyte growing over cane stubble in Hawaii." Caum 1. c.

136. OIDIUM (Link.) Emend Sacc. Mich. vol. 2, p. 15, 1880
(See also Erysiphaceae, p.

Since no perithecia were found, definite determination of the species cannot be made.

No. 334. **Oidium** (probably of *Microsphaera euphorbiae* Pk. B. and C.)
On *Euphorbia sp.* Hawaii: Keauhou, Kona, July 22, no. 926.

No. 335. **Oidium** (probably of *Erysiphe polygoni* DC.)
On *Cassia occidentalis.* Oahu: Honolulu, Hillebrand gardens, May 22, no. 37. Hawaii: Kukuihaele, August 3, no. 1117.

No. 336. **Oidium** (probably of *Erysiphe cichoraiearum* DC., possibly of *Sphaerotheca humuli* (DC.) Burr).
On *Xanthium italicum.* Oahu: Honolulu, School street, May 28, no. 130. Hawaii: Kukuihaele, no. 1095.
On Dahlia (cult.). Hawaii: Keauhou, Kona, Bishop Estate road, July 23, no. 930. Maui: Olinda pipeline, Sept. 5, no. 1146.
On Zinnia (cult.). Oahu: Honolulu, June 4, no. 272.

No. 337. **Oidium** (probably of *Sphaerotheca pannosa* (Wallr.) Lév. or *Sphaerotheca humuli* (DC.) Burr).
On Rose (cult.). Hawaii: Waimea, July 30, no. 1037; Wailuku, Sept. 5, no. 1150. Also collected by C. W. Carpenter on Oahu, Rept. 19.

No. 338. **Oidium** (probably of *Sphaerotheca humuli* (DC.) Burr.)
On *Erigeron sp.* Hawaii: Waimea, July 30, no. 1044.
On *Coreopsiss* Hawaii: Waimea, July 30, no. 1041.

MONILIACEAE-AMEROSPORAE-CEPHALOSPORIEAE

137. TRICHODERMA Pers. Disp. fung. p. 12, 1797

No. 339. **Trichoderma lignorum** (Tode) Harz, Einige neue Hypho. Berlin u. Wien, 1871

On *Saccharum officinarum.*

"On dead cane in Hawaii." Caum.

138. ALLANTOSPORA Wakk. Arch. v. de Java Suikerindust, 1896

No. 340. **Allantospora radicicola** Wakk. op. cit.

On *Saccharum officinarum.*

"Parasitic on young roots in Hawaii. Also a general cane saprophyte in Hawaii."—Caum.

MONILIACEAE-AMEROSPORAE-BOTRYTIDEAE

139. SPOROTRICHUM Link. über die Gattung Sporotrichum in Link Jahrbücher der Gewachskunde Bd. 1, 1818, pp. 163-183

No. 341. **Sporotrichum sp.**

On *Perkinsiella saccharicia.*

On Semnoprepia, Genophantis and other caterpillars.[22]

140. BOTRYTIS Mich. em. Link. Sp. Pl. vol. 1, p. 53, 1924

No. 342. **Botrytis grassi** (?)

On *Adoretus sinicus, Anomala orientalis, Pseudolus hospes, Calandra remota, Stenommatus musae,* Scolytids.[23]

No. 343. **Botrytis sp.**

Conidiophores thick, 393-1244 by 10-18 μ, branched; branches geniculate, straw-colored, granular, tips smooth. Conidia borne near the apices of branches, globose to ovoid, straw-colored, 9-11 by 6-7 μ. See fig. 31, *a.*

On *Passiflora sp.* Hawaii: Keauhou, Kona, Bishop Estate road, July 23, no. 941.

This species of Botrytis could not be cultured, and therefore could not be determined satisfactorily. It causes actual rotting of the Passiflora leaves.

[22] Unpublished record of O. H. Swezey.
[23] Unpublished record by O. H. Swezey.

MONILIACEAE-PHRAGMOSPORAE

141. RAMULARIA Ung. Exanthem. d. Pflanz. p. 169, 1833
Emend. Sacc. Mich. vol. 2, p. 20, 1880

No. 344. **Ramularia ipomoeae** Stevens n. sp.

Spot 5-15 mm. in diameter, indefinite, roughly circular, yellow and later brown and dead. Fungus amphigenous. Conidiophores hyaline, very short, barely emerging, crowded in large numbers in the stomata. Conidia hyaline, cylindrical, straight or crooked, obtuse, 1-3 septate, 20-60 by 2-3.5 μ.

On *Ipomoea bona-nox* (moonflower, cult.). Hawaii: Kealakekua, July 21, no. 908. Associated with *Sphaerulina ipomoeae* (see p. 106).

No. 345. **Ramularia nephrolepis** Stevens n. sp.

Spots dark, dead, definite. Fungus hypophyllous emerging as white or pink clusters. Conidiophores hyaline, profusely and irregularly branched, emerging from the stomata. Conidia of two kinds: *a*, ovate to elliptical and obtuse, 7-14 by 3 μ; *b*, longer, and falcate or straight, continuous or several septate. (See fig. 31, *b*.)

On *Nephrolepis exaltata*. Hawaii: between Kapapala ranch and Kona, July 20, no. 896; Oahu: Palolo valley, June 10, no. 311, Ahren's ditch trail, June 8, no. 287.

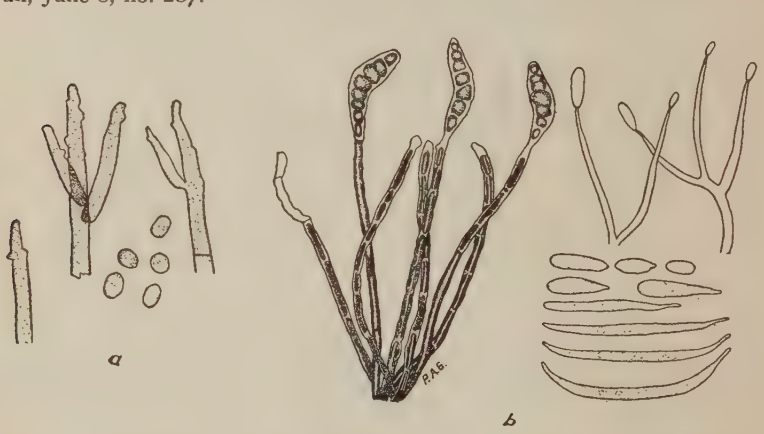


FIGURE 31.—Conidiophores, conidia, and spores: *a*, of *Botrytis sps.* (No. 941) on Passiflora; *b*, of *Ramularia nephrolepis* (No. 896) on *Nephrolepis exaltata*—conidiophores and two kinds of conidia.

The fungus when fresh in the field is conspicuous on the lower sides of the dead spots, as either white, or vivid red, clumps of conidiophores. The vividness of the color is largely lost in dried material. The conidiophores branch more than is usual and the variation in spore shape also is much more than is common in Ramularia.

No. 346. **Ramularia microlepiae** Stevens n. sp.

Spots dead, brown to black. Fungus hypophyllous, conidiophores simple, hyaline, short (about 18 μ long), crowded in great numbers in the stomata. Conidia whip-shaped, tapering, hyaline, many septate, 40-80 μ by 3 μ.

On *Microlepia sps.* Oahu: Wahiawa, May 31, no. 169; Kalihi valley, June 2, no. 175; Wahiawa, June 3, no. 255; Ahren's ditch trail, June 8, no. 282; Palolo valley, June 10, no. 336; Waiahole ditch trail, June 12, no. 391; Tantalus, June 22, no. 606; Kolekole pass, June 27, no. 729. Kauai: Kalalau trail, June 16, no. 500. Maui: Pogue's ditch trail, Sept. 6, no. 1155.

Pycnidia apparently of a Phoma, was abundant on some of the dead spots, substomatal small (45-60 μ), black, spores, 9 by 3.5 μ, obtuse, hyaline.

No. 347. **Ramularia tulasnei** Sacc. Michelia, vol. 1, p. 536, 1879

On *Fragaria sp.* (strawberry). Hawaii: Kapapala ranch, July 18, no. 884.

142. PIRICULARIA Sacc. Mich. op. cit.

No. 348. **Piricularia grisea** (Cooke) Sacc. Mich. op. cit.

On *Oryza sativa* (rice). C. W. Carpenter (29, Rept. 1918).

DEMATIACEAE

DEMATIACEAE-AMEROSPORAE-TORULEAE

143. MONILOCHAETES Ell. and Halsted in Bul. 76, N. J. Agr. Exp. Sta. 1890

No. 349. **Monilochaetes infuscans** E. and H.

On *Ipomoea batatas* (sweet potato). Kauai: 1917, C. W. Carpenter; Oahu: Honolulu, 1916, C. W. Carpenter. Also reported by Carpenter in 1917 (29, Rept.).

DEMATIACEAE-AMEROSPORAE-TRICHOSPORIEAE

144. BASISPORIUM Molliard, Bull. Soc. Myc. d. France, vol. 18, p. 167, 1902

No. 351. **Basisporium gallarum** Moll.

On *Saccharum officinarum* (sugar cane).

"A saprophyte on living cane leaves. Hawaii."—Caum.

DEMATIACEAE-AMEROSPORAE-HAPLOGRAPHIEAE

145. HORMIACTELLA Sacc. Syll. Fung. vol. 4, p. 311, 1884

No. 352. **Hormiactella sacchari** Johns. Johnston, Jour. Dep. Agr. Porto Rico, vol. 1, p. 224, 1917

On *Saccharum officinarum*

"Johnston believes that this fungus has been reported from Hawaii."—Caum.

DEMATIACEAE-DIDYMOSPORAE

146. CLADOSPORIUM Link. Sp. Pl. Fungi vol. 6, p. 39, 1824

See under *Phyllosticta colacasiophila,* pp. 129-132.

DEMATIACEAE-PHRAGMOSPHOREAE

147. HELMINTHOSPORIUM Link. Berl. Mag. vol. 3, p. 10, 1809

No. 352. **Helminthosporium cibotii** Stevens and Weedon n. sp.

Spots 3-7 mm. in diameter, irregularly circular, center tan-colored, shrunken, thin, surrounded by a densely black border 1-2 mm. wide, which shades off into a pale zone. Fungus hypophyllous. Conidiophores crooked, emerging through the stomata often several from one stoma, simple, short (70 μ), black, 7 μ thick at base, dark at base, pale at tip. Conidia dark, very crooked, many septate (to 8), 36-55 by 5 μ, often attenuated at one end. (See fig. 32.)

On *Cibotium sp.* Oahu: Mt. Olympus, June 10, no. 346.

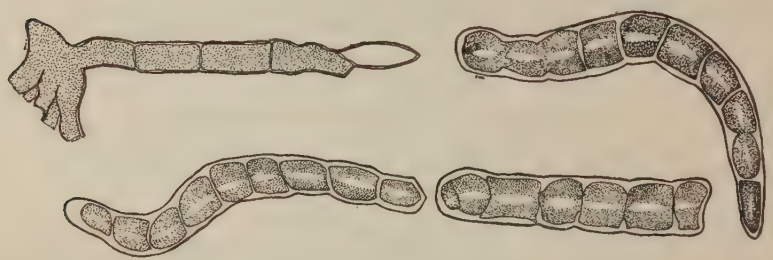


FIGURE 32.—Conidiophore and three conidia of *Helminthosporium cibotii* (No. 346) on *Cibotium sp.*

This species is of the same general type as *H. gleicheniae,* but differs from it in many details as to conidia and conidiophores, and particularly in the character of the spot formed on the host.

No. 353. **Helminthosporium gleicheniae** Stevens and Glick, n. sp.

Spots amphigenous, irregular in size, sometimes occupying the whole pinnule. Conidiophores hypophyllous, very dark, erect, thick, stiff, with irregular swellings, fasciculate from the stomata, apex rounded, hyaline, 219-265 by 7-8 μ. Conidia dark brown, subclavate, geniculate; 5-9 septate (mostly 8); 27-42 by 7-9 μ. Mycelium pale-brown, irregularly branched. (See fig. 33, *a.*)

On *Gleichenia dichotoma.* Oahu: Ahren's ditch trail, June 8, no. 283; Wahiawa, June 3, no. 223; Olympus, June 24, no. 673; Palolo valley and Mt. Olympus, June 10, no. 371. Kauai: Kalalau trail, June 16, no. 509.

The septation and dimensions of the conidia are given in Table III:

TABLE III.—SHOWING SEPTATION AND DIMENSIONS OF HELMINTHOSPORUM CONIDIA

SEPTATION OF CONIDIA

Septa	0	1	2	3	4	5	6	7	8	9	
Frequency	2	1	2	1	5	9	22	49	8	1	Total 100

CONIDIAL MEASUREMENTS (IN MICRONS—LENGTH)

Microns	27	29	32	35	36	37	40	42	47	
Frequency	2	1	3	1	8	1	5	7	3	Total 32

CONIDIAL MEASUREMENTS (IN MICRONS—WIDTH)

Microns	7	8	9	
Frequency	18	3	11	Total 32

No. 354. **Helminthosporium ravenelii** Curt. and Berk. North. Am. Fung. no. 368.

On *Sporobolus elongatus*. Hawaii: Kilauea, July 13, no. 802; Waimea. July 27, nos. 1022 and 1038.

148. ACROTHECIUM Preuss, Ueber. unt. Pilze. Hoyersw. in Linnaea, vol. 24, p. 110, 1851. Emend. Sacc. Mich. vol. 2, p. 29

No. 355. **Acrothecium lunatum** Wakk. Ziekt. Suik. p. 196, 1898

On *Saccharum officinarum* (sugar cane).

"A saprophyte on cane leaves in Hawaii."—Caum.

DEMATIACEAE-DICTYOSPORAE

149. ALTERNARIA Nees. Syst. d. Pilze, p. 72, 1817

No. 356. **Alternaria solani** (Ell. and Martin) Jones and Grout, Bull. 72, Vt. Agr. Exp. Sta. 1899

Macrosporium solani. Ell. and Mart., Amer. Nat. vol. 16, p. 1003, 1882.

On *Solanum tuberosum* (potato). Oahu: Honolulu, Oct. 9, 1917, C. W. Carpenter no. 171, also seen at Mokuleia. Also noted by C. W. Carpenter as on Maui and Hawaii; and as prevalent in the territory.

No. 357. **Alternaria sonchi** Stevens n. sp.

Spot definite, angular, limited by the veins, brown, dead, border purple. Conidiophores pale brown, issuing from the stomata, usually solitary, rarely two or three, geniculate, usually about 90-100 μ long, 7 μ thick, thicker at the base. Conidia dark brown, muriform, 70 by 11 μ, catenulate, beaked when mature.

On *Sonchus oleraceus.* Oahu: Honolulu, May 19, nos. 6 and 12; also May 20, no. 20; Tantalus, May 25, no. 104; Wahiawa, June 3, no. 221. Kauai: upper Waimea canyon, June 15, no. 420.

The fungus appears to be truly parasitic and the cause of the dead spots. The solitary conidiophores from the stomata are characteristic.

DEMATIACEAE-SCOLECOSPORAE

150. CERCOSPORA Fres. Beitrage 3, p. 91, 1863

No. 358. **Cercospora arctii** Stevens n. sp.

Spots definite, angular, limited by the veins, at first brown, later ashen to white. Fungus amphigenous. Conidiophores brown, septate, geniculate, simple, fascicled from the stomata, about 70-90 μ long. Conidia pale, long, whip-shaped, many septate, obtuse, 30-90 by 3 μ.

On *Arctium lappa* (cult.). Hawaii: Kukuihaele, Aug. 2, no. 1096.

No. 359. **Cercospora agerati** Stevens n. sp.

Spots indefinite, irregular, pale above. Fungus hypophyllous, gray to smoky. Conidiophores light brown, septate, irregular, geniculate, much branched, lax, appearing in fascicles from the stomata. Conidia linear, hyaline, continuous or often 1-septate, obtuse, 18-33 by 3-4 μ.

On living leaves of *Ageratum conyzoides.* Hawaii: Wailuku river, July 8, no. 750; Kealakekua, July 23, no. 944.

No. 360. **Cercospora althaeina** Sacc. Mich. vol. 1, p. 269, 1879

On *Mediola caroliana.* Hawaii: Waimea, July 29, no. 1024, O. H. Swezey, also July 30, no. 1047; Hamakua, upper ditch trail, July 31, no. 1082.

No. 361. **Cercospora beticola** Sacc. Fung. Veneti. Ser. 5, p. 189, 1878

On *Beta vulgaris.* Oahu: between Diamond Head and King street, Honolulu, May 19, no. 18.

No. 362. **Cercospora coffeicola** Berk. and Curt. Grev. vol. 9, p. 99, 1881

On *Coffea arabica* (cult.). Hawaii: Kealakekua, July 23, no. 939. Also reported by C. W. Carpenter.

No. 363. **Cercospora bolleana** (Thüm) Speg. in Mich. vol. 1, p. 475, 1879

On *Ficus carica* (fig). Oahu: C. W. Carpenter (29, Rept. 1919).

No. 364. **Cercospora echinocystis** Ell. and Mart. Amer. Nat. vol. 16, p. 100, 1882

On "Chinese cucumber." Oahu: Waialua, October 10, 1913, L. D. Larson, Lyon no. 405.

No. 365. **Cercospora megalopotamica** Speg. Fung. Arg. Pug. 3, no. 342, 1881

On *Bidens leucantha.* Hawaii: Kukuihaele, August 2, no. 1100.

No. 366. **Cercospora nicotianae** Ell. and Ev. Proc. Acad. Sc. Phil. p 170, 1893

On *Nicotiana tabacum* (cult.). Hawaii: Kealakekua, July 22, no. 925.

No. 367. **Cercospora pipturi** Stevens and Glick n. sp.

Spots hypophyllous, diffuse, indefinite, fuscous, 2-5 μ in diameter. Conidiophores long, lax, fasciculate from the stomata, branched, septate, straw-colored; conidia obclavate, 4-7 septate, 40-100 by 5-8 μ, slightly bent or often curved, granular, fuscous. (See fig. 33, *b*.)

On *Pipturus albidus.* Kauai: Kalalau trail, June 16, no. 538; Hawaii: between Hilo and Kilauea, July 10, no. 766; Kapapala ranch, July 18, no. 894; between Kona and Waimea, July 27, no. 1020; Maui: Olinda pipeline, Sept. 5, no. 1140; Oahu: Olympus, June 24, no. 713.

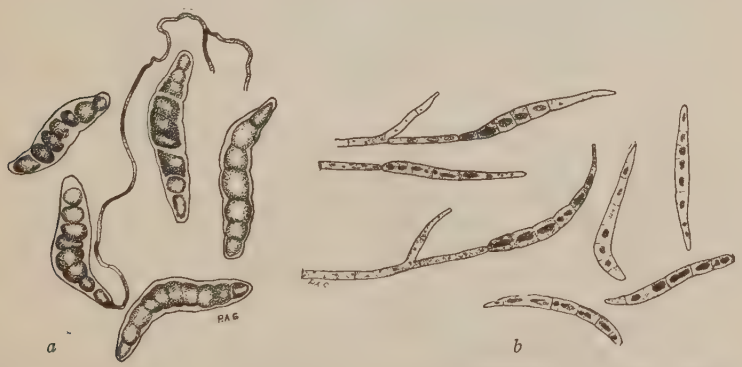


FIGURE 33.—Conidiophores and conidia: *a*, of *Helminthosporium gleicheniae*, showing single spore, germinating; *b*, conidia and conidiophores of *Cercospora pipturi* on *Pipturus albidus.*

This species is very close to *C. ferruginea* Fcl., and *C. bellynckii* (West) Sacc., but since it differs somewhat in conidial measurement and occurs on a host of very different family, we regard it as a distinct species.

No. 368. **Cercospora plantaginis** Sacc. Mich. vol. 2, p. 268.

On *Plantago sp.* Kauai: Upper Waimea canyon, June 15, no. 433.

No. 369. **Cercospora tectoniae** Stevens n. sp.

Spots 2-3 μ. in diameter or by confluence larger, angular, definite, border reddish brown, center ashen-white. Conidiophores brown, usually solitary or few, geniculate, 100-150 μ long by 3.5 μ wide. Conidia whip-shaped, tapering, hyaline, septate, about 90 μ long, curved.

On *Tectonia grandis.* Oahu: Honolulu, Hillebrand gardens, May 22, no. 52.

No. 370. **Cercospora sacchari** v. Breda d. Haan. Mededeel Suiker, 1892
On cane leaves in Hawaii."—Caum.

No. 371. **Cercospora sagittariae** Ell. and Kell. Jour. Myc. vol. 2, p. 1, 1886
On *Sagittaria sagittifolia.* Oahu: Between Diamond Head and King street, Honolulu, May 19, no. 7, also May 28, no. 129.

No. 372. **Cercospora alabamensis** Atk. Cerc. Ala. Jour. Elisha Mitchel Soc. 8, 51, 1891
On *Ipomoea pes-caprae.* Oahu: Honolulu, May 19, no. 11; Kauai: Waimea, June 17, no. 540.

No. 373. **Cercospora vaginae** Krug. Ber. Zuck. vol. 2, p. 249, 1896
On *Saccharum officinarum* (cane).
"Parasitic on the sheaths, probably in Hawaii."—Caum.

DEMATIACEAE-ENDOCONIDEAE

151. THIELAVIOPSIS Went. De Ananaziekte Archief. Java Suikerindustrie, p. 8, 1893

No. 374. **Thielaviopsis paradoxa** (de Seyn) v. Höhn. Hedw. 43, p. 295, 1904
On *Saccharum officinarum* (cane).
"A wound parasite in Hawaii. Said by Massee to be a form of *Trichosphaeria sacchari.*"—Caum.

152. EXCIOCONIDIUM O. A. Plunkett [22a] n. g.

Fertile hyphae, erect, dark septate, conidia hyaline, septate, cylindric, born internally in fertile hyphae.

No. 375. **Excioconidium cibotti** O. A. Plunkett, n. sp.
Fertile hyphae, arising from a subcuticular mass of mycelium, dark, erect, cylindrical to clavate, septate at base, tips inflated, when mature 90-225 by 6.5-10-5 μ. Conidia separate, hyaline, elongate, cylindrical, 4-8-celled, slightly constricted, ends rounded, 31-42 by 5-7 μ, borne singly in the interior of fertile hyphae and discharged at the tips. (See fig. 34.)
Saprophytic on stems of *Cibotium chamissoi.* Hawaii: Kilauea, July 13, no. 810.

[22a] The section on Excioconidium was prepared by O. A. Plunkett.

The fungus described above seems worthy of special mention on account of the fact that the conidia are produced internally. This character is rather rare among the Dematiaceae, and, to my knowledge, exists in only six genera listed in Saccardo's Sylloge Fungorum. The genera previously listed as bearing conidia internally are Conioscypha, Chalara, Thielaviopsis, Thielavia, Cirromyces, and Sporoschisma. These genera are scattered throughout the different divisions of the Dematiaceae. Lindau has brought several of them together under one sub-family, and it seems that the single

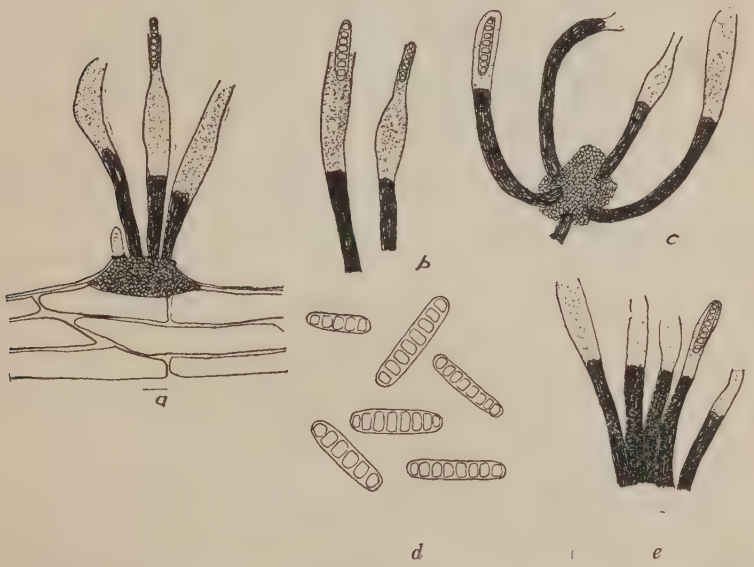


FIGURE 34.—*Excioconidium cibotii* (No. 810) on *Cibotium chamissoi: a,* showing four conidiophores arising from a small tubercular base; *b,* two conidiophores showing conidia emerging; *c,* showing conidiophores; *d,* conidia; *e,* conidiophores viewed from another aspect.

character of endo-conidial production is sufficient to warrant the bringing together of all these scattered genera into one division or group. The fungus *Excioconidium cibotii,* described above, does not agree closely enough in some of its essential characters to place it in any of the existing genera mentioned. Considerable difficulty arises in trying to determine its proper position in any of the systems. In view of this fact and the fact that it should at least be associated with the other endoconidial fungi of the Dematiaceae, I propose that all the endo-conidial fungi of this family be

placed in a new section to be known as the Endoconideae. The following from Rabenhorst (146) is a suggested key to such a classification:

KEY TO GENERA OF ENDOCONIDEAE

Conidia hyaline or colored one- to several-celled, arising within the hyphae
- Conidia one-celled, hyaline, or dark
 - Conidia solitary, dark
 - Hyphae branched; the dark conidium at first enclosed in a vesicle from which it escapes at the apex **Conioscypha**
 - Conidia in chains, hyaline
 - Conidia of two kinds; microconidia borne inside fertile hyphae
 - Macroconidia short, cylindric with a thick, brown wall; borne in a series of three to six on hyaline branches **Thielavia**
 - Macroconidia catenulate, ovate, thin walled 151 **Thielaviopsis**
 - Conidia of one kind only
 - Conidia in simple chains **Chalara**
 - Conidia conglutinate, in a long curl **Cirromyces**
- Conidia several celled, hyaline or dark
 - Conidia solitary
 - Fertile hyphae erect, septate, dark; conidia pluriseptate, hyaline, cylindrical, obtuse 152 **Excioconidium**
 - Conidia usually catenulate
 - Fertile hyphae simple, erect; conidia pluriseptate, dark, cylindrical, truncate **Sporoschisma**

Excioconidium cibotii gives to the surface of the dead stems of Cibotium a smoky appearance scarcely noticeable to the naked eye. This is due to the brown conidiophores scattered over the surface, grouped together in fascicles of from 4 to 9. (See fig. 34, *a.*) The fertile hyphae vary in length and in the number of basal cells. The yellowish sac-like apical cells of the hyphae contain but a single spore at one time. (See fig. 34 *a, b.*) It seems probable, however, that a hypha produces more than a single spore. From the difference in the number of basal cells in the various conidiophores and the appearance thereof, one might assume that the contents of these cells undergo a change, from time to time, and become spores. (See fig. 34, *b, c.*) The conidia are hyaline, slightly granular, and usually 8-celled; however, 4- and 5-celled conidia have been observed. The basal mass of mycelium to some extent resembles a tubercle but it is not thought distinct enough to place the fungus in the Tuberculariaceae.

STILBACEAE

HYALOSTILBEAE

153. ISARIA Pers. Tentam Dispos. Meth. Fung. 1797

No. 376. **Isaria saussurei** Cooke (?)
On *Polistes sp.* (H. S. P. A. Bul. 12, 1912.)

PHAEOSTILBEAE-AMEROSPORAE

154. GRAPHIUM Corda. Icones fung. vol. 1, p. 18, 1837

No. 377. **Graphium dubautiae** Stevens and Weedon n. sp.

Spots viewed from above are with white centers 1-2 m., in diameter, surrounded by a broad, 2-3 mm., dark purple border. Spots from below are tan-colored. Fungus hypophyllous. Synemata few on each spot, sterile, basal portion either short (60 μ), or long (310 μ), by 20 μ thick. Base dark, shading to nearly hyaline at the top. Synema separating toward the upper third of its length into the component filaments, which are about 3.5 μ in diameter and sometimes free for a distance of 100 μ. Conidia acrogynous, hyaline, continuous, cylindrical, obtuse, 8-18 by 3.5 μ. (See fig. 35.)

On *Dubautia laxa*. Oahu: Tantalus, June 22, no. 650.

No. 378. **Graphium sp.** "Undetermined species occur on cane leaves in Hawaii."—Caum.

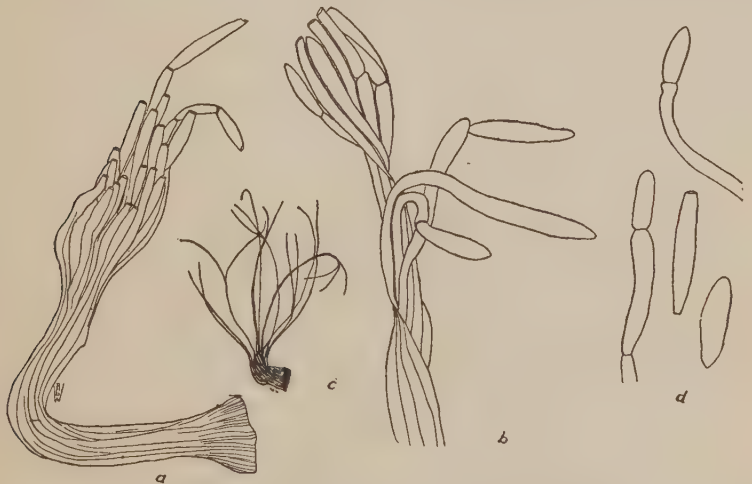


FIGURE 35.—Coremia of *Graphium dubautiae* (No. 650) on *Dubautia laxa; a, b, d,* detail of the conidiophore apex and the conidia; *c,* habit sketch of a coremium.

PHAEOSTILBEAE-PHRAGMOSPORAE

155. ISARIOPSIS Fr. in Sacc. Mich. vol. 2, p. 33, 1880

No. 379. **Isariopsis griseola** Sacc. Mich. vol. 1, p. 273, 1879

On *Phaseolus vulgaris* (cult.). Hawaii: Kapapala ranch, July 18-19, no. 885; Oahu: Honolulu, C. W. Carpenter (29, Rept. 1918) Maui: Kula, 1917.

TUBERCULARIACEAE

MUCEDINEAE-PHRAGMOSPORAE

156. FUSARIUM Link. Berl. Mag. vol. 3, p. 10, 1809

No. 380. **Fusarium coeruleum** (Lib.) Sacc. Syll. Fung. vol. 4, p. 705, 1884

On *Solanum tuberosum* (potato) (29, Bul. 45, 1920; Rept. 1918).

No. 381. **Fusarium oxysporum** Schlecht. Fl. Berolinensis, vol. 2, p. 139, 1824

On *Solanum tuberosum* (potato). Maui: Waiakoa, 1916, 1917 by C. W. Carpenter. Oahu: Honolulu, 1916, C. W. Carpenter (29, Rept. 1917).

No. 382. **Fusarium radicicola** Wollenweber Journ. Agr. Res. vol. 2, p. 257, 1914

On *Solanum tuberosum* (potato. Maui: Waiakoa, 1916, C W. Carpenter (29, Repts. 1917, 1918, and Bul. 45, 1920).

On Roselle. Maui: Lahaina, 1916, Haw. Agr. Expt. Sta. Rept. 1918. C. W. Carpenter.

On Persea. Oahu: Honolulu, 1916. C. W. Carpenter.

No. 383. **Fusarium solani** (Mart) Sacc. Mich. vol. 2, p. 296, 1880

On *Ipomoea batatas* (sweet potato). Kauai: 1917. C. W. Carpenter. Also Haw. Agr. Exp. Sta. Rept. 1917.

No. 384. **Fusarium vasinfectum** Atk., Alabama Agr. Exp. Sta. Bull. 41, p. 19, 1892

On *Musa sp.* (banana). Reported by Carpenter (29, Rept. 1917).

DEMATIEAE-AMEROSPORAE

157. STRUMELLA Sacc. Mich. vol. 2, p. 36, 1880

No. 385. **Strumella sacchari** Cke. Grev. vol. 19, p. 45, 1890
Melanconium sacchari Mass.

"On *Saccharum officinarum* (sugar cane)."—Caum.

DEMATIEAE-DICTYOSPORAE

158. SPEGAZZINIA Sacc. Mich. vol. 2, p. 37, 1880

No. 386. **Spegazzinia ornata** Sacc. Mich. vol. 2, p. 172, 1880

On *Meliola sp.* Lyons list no. 60a.

MYCELIA STERILIA

KEY TO GENERA HEREIN NOTED

Tubercle-like
- Tubercles connected by fibrils 159 **Rhizoctonia**
- Tubercles not connected by fibrils 160 **Sclerotium**

Cobwebby
- Adpressed, creeping, dendritic 161 **Himantia**
- Cespitose interwoven 162 **Rhacodium**

159. RHIZOCTONIA Kühn, Krankheiten der Kultur Gewachse p. 224, 1858.

No. 387. **Rhizoctonia solani** Kühn, Krankheiten der Kulturgewächse, p. 224, 1858

On *Solanum tuberosum* (potato). Oahu: Honolulu, 1916 (29, Bul. 45, 1920). Also reported in 1918. Said to be in all fields seen (29, Rept. 1917).

No. 388. **Rhizoctonia sp.**

"On cane roots in Hawaii."—Caum.

On *Brassica rapa* (turnip). C. W. Carpenter (29, Rept. 1918).

160. SCLEROTIUM Tode. Fung. Meckl. Sel. 1790

No. 389. **Sclerotium rolfsii** Sacc. in Ann. Myc. vol. 9, p. 257, 1911

On *Saccharum officinarum* (sugar cane).

"A sheath parasite in Hawaii."—Caum.

On *Arachis hypogaea* (peanut). Oahu: Hawaii. C. W. Carpenter.

On *Solanum tuberosum* (potato). Honolulu in 1913, Larsen.

Also C. W. Carpenter (29, Bul. 45, 1920).

On *Colocasia antiquorum* (taro). (29, Rept. 1918.)

No. 390. **Sclerotium sps.**

On *Saccharum officinarum* (sugar cane).

"Several undetermined species parasitic in Hawaii."—Caum.

161. HIMANTIA Pers. Tent. Disp. Meth. Fung. p. 42, 1797

No. 391. **Himantia stellifera** Johns. Jour. Dept. Agr. Porto Rico, vol. 1, p. 188, 1917

On *Saccharum officinarum* (sugar cane).

What is apparently this same fungus has been reported from Hawaii." —Caum.

162. RHACODIUM Pers. Synop. meth. Fung. p. 701

No. 392. **Zasmidium tropicum** (Mont.) Reich. Reichardt, H. W. Miscellen 19, Beiträge zur Pilze flora von Niederöstereich, Verh. Zool. Bot. Ges. Wien. vol. 17, 1867

The genus Zasmidium Fr. is given by Saccardo as synonymous with Rhacodium. A Zasmidium as named above was reported from Hawaii by Reichardt.

FUNGUS OF UNKNOWN AFFINITY

163. GRAPHIOLA Poit. in Ann. Sci. Nat. Bot. p. 473, 1824

No. 393. **Graphiola phoenicis** (Mong.) Poit., op. cit.

On *Phoenix dactylifera.* Oahu: Honolulu, June 4, no. 275; Kapiolani Park, 1913, Lyon no. 263.

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM

HOST	FUNGUS
Abutilon incanum	Puccinia heterospora
menziesii	Puccinia heterospora
Acacia farnesiana	Ravenelia siliquae
koa	Lophodermium intermissum
	Hypoxylon annulatum
	Meliola koae
	Nummularia guaranitica
	Uromyces koae
	Xylaria rhopaloides
Acrostichum sp.	Pestalozzia sp.
Adoretus sinicus	Botrytis grassi
	Metarrhizium anisopliae
Agapanthus sp.	Colletotrichum dracaenae
umbellatus	Phoma agapanthi
Ageratum conyzoides	Cercospora agerati
	Puccinia conoclinii
Albizzia lebbek	Phoma henningsii
Aleurites (rotten)	Xylaria curta
	Xylaria schweintzii
	Nectria subquaternata var farinosa
Alfalfa, see Medicago	
Alphitonia excelsa	Irene splendens
ponderosa	Hyalocurreya sandicensis
Alyxia olivaeformis	Amazonia psychotriae
	Guignardia alyxiae
	Meliola alyxiae
	Trichothallus hawaiiensis
	Trichopeltis reptans
	Trichopeltis rhyacoides
	Uromyces alyxiae

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Ananas sativus	Pythium butleri
Anchonymus agonoides	Laboulbenia disenochi
Anomala orientalis	Botrytis grassi
	Metarrhizium anisopliae
Antidesma platyphyllum	Pestalozzia sp.
Apium graveolens	Septoria apii
Arachis hypogaea	Septogloeum arachidis
	Sclerotium rolfsii
Arctium lappa	Cercospora arctii
Artocarpus incisa	Colletotrichum artocarpi
	Mycosphaerella artocarpi
Atelothrus constrictus	Laboulbenia cauliculata
depressus	Laboulbenia cauliculata
erro	Laboulbenia hawaiiensis
gracilis	Laboulbenia hawaiiensis
Avena sativa	Puccinia rhamni
	Ustilago avenae
Avocado, see Persea	
Bamboo, see Bambusa	
Bambusa	Lageniforma bambusae
Banana, see Musa	
Barringtonia asiatica	Gloeosporium barringtoniae
	Phoma barringtoniae
Baumea meyenii	Aulographella baumeae
	Meliola cyperi
	Pestalozzia sp.
	Trichopeltis reptans
Bean, see Phaseolus	
Beet, see Beta	
Bembidium sps.	Laboulbenia hawaiiensis
Beta vulgaris	Cercospora beticola
Bidens leucantha	Cercospora megalopotamica
Brassica campestris	Albugo candida
rapa	Rhizoctonia sp.
Brosconymus optatus	Laboulbenia disenochi
Broussaisia sp.	Trichothallus hawaiiensis
Bryonia sandwicensis	Asterinella humiriae
Calandra remota	Botrytis grassi
Canavalia ensiformis	Fusicoccum canavaliae
	Gloeosporium canavaliae
	Massalongiella canavaliae
	Septoria canavaliae
Cane, see Saccharum	
Capriola dactylon	Puccinia cynodontis
Carex oahuensis	Uredo hawaiiensis
Carnation, see Dianthus	
Casimiroa edulis	Phyllosticta casimiroae
Cassava, see Manihot	
Cassia occidentalis	Oidium
Cattleya	Macrophoma cattleyicola
Celery, see Apium	
Cenchrus hillebrandianus	Puccinia cenchri
Cerastium sp.	Septoria cerastii
Cereus sp.	Gloeosporium cerei

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Cheirodendron gaudichaudii	Irene cheirodendronis
"Chinese cucumber"	Cercospora echinocystis
Chrysanthemum indicum	Puccinia chrysanthemi
	Septoria rostrupii
Cibotium chamissoi	Exioconidium cibotii
	Yoshinagella nuda
	Y. polymorpha var. pauciseta
menziesii	Sphaerulina cibotii
	Yoshinagella polymorpha
sp.	Helminthosporium cibotii
Citrus aurantium	Colletotrichum gloeosporioides
Claoxylon sandwicense	Asterina ildefonsiae
	Meliola morbosa
Clermontia kakeana	Septoria clermontiae
multiflora	Amazonia psychotriae
	Trichopeltis reptans
oblongifolia	Calothyriopeltis clermontiae
sandwicensis	Asterina clermontiae
	Amazonia psychotriae
	Asterina clermontiae
	Meliola lobeliae
	Septoria clermontiae
	Trichothallus hawaiiensis
	Trichopeltis reptans
Cocculus ferrandianus	Clypeolella clermontiae
	Echidnodella cocculi
Codiaeum moluccanum	Phyllosticta codiaei
Coffee, see Coffea	
Coffea arabica	Cercospora coffeicola
	Gloeosporium sp.
Colocasia antiquorum	Sclerotium rolfsii
sp.	Phyllosticta colocasiophila
	Phytophthora colocasiae
	Pythium sp.
Colopodiscus lucipetens	Laboulbenia hawaiiensis
Colpocaccus hawaiiensis	Laboulbenia hawaiiensis
lanaiensis	Laboulbenia cauliculata
	Laboulbenia hawaiiensis
marginatus	Laboulbenia cauliculata
posticatus	Laboulbenia hawaiiensis
tantalus	Laboulbenia hawaiiensis
Coprosma sp.	Actinodothidopsis coprosmae
	Amazonia psychotriae
Coreopsis sp.	Oidium (Sphaerotheca humuli)
Cordyline terminalis	Phyllosticta cordylinophila
Cortaderia argentea	Apiospora montagnei
Cotton, see Gossypium	
Cryptocarya manii	Meliola peleae
Cyanea angustifolia	Mycosphaerella cyaneae
Cyanea sp.	Trichopeltis reptans
Cyrtandra cordifolia	Irene cyrtandri
lessoniana	Irene cyrtandri
Dahlia	Oidium (Erysiphe cichoracearum)
sp.	Phomopsis achilleae

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Dianella odorata	Colletotrichum dianellae
	Meliola gregoriana
	Mycosphaerella dianellae
	Phaeosphaerella dianellae
	Pirostoma dianellae
Dianthus	Pestalozzia sp.
	Uromyces caryophyllinus
Dicotyledon	Trabutia minima
	Amozonia psychotriae
	Phaeosphaerella hawaiienses
Disenochus aterrimus	Laboulbenia disenochi
fractus	Laboulbenia disenochi
sulcipennis	Laboulbenia disenochi
Dodonaea viscosa	Meliola lyoni
Dracaena aurea	Leptosphaeria dracaenae
	Meliola dracenae
	Coniothyrium dracaenae
draco	Phyllosticta draconis
Dubautia laxa	Graphium dubautiae
Egg plant, see Solanum	
Elaphoglossum	Trichothallus hawaiiensis
sp.	Trichopeltis reptans
Eragrostis variabilis	Phyllachora graminis
Erechtites sp.	Phyllosticta erechtitis
Erigeron sp.	Oidium (Sphaerotheca humuli)
Erythrina monosperma	Stagonospora erythrinae
Eucalyptus	Fuligo septica
Eucalyyptus globulus	Pestalozzia sp.
robusta	Harknessia hawaiiensis
sp.	Lembosia eucalypti
Eugenia malaccensis	Pestalozzia sp.
sandwicensis	Meliola hawaiiensis
	Mycosphaerella eugeniae
sps.	Mycosphaerella eugeniae
Euphorbia clusiaefolia	Amazonia psychotriae
	Questieria euphorbiae
	Uredo stevensii
cordata	Puccinia velata
hookeri	Puccinia velata
multiformis	Puccinia velata
serphyllifolia	Uromyces proeminens
sp.	Oidium (Sphaerotheca humuli)
	Uredo stevensii
Fern	Fuligo septica
Ficus carica	Cercospora bolleana
	Gloeosporium sp.
Fragaria sp.	Ramularia tulasnei
Freycinetia arnotti	Clypeosphaeria stevensii
	Gibberella lagerheimii
	Melanomma clypeatum
	Mycosphaerella freycinetiae
	Peltella freycinetiae
	Phyllachora freycinetiae
	Seynesia atkinsonii
	Trichothallus hawaiiensis

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Gahnia gaudichaudii	Meliola cyperi
leptostachya	Meliola cyperi
Genophantis sp.	Sporotrichum sp.
Geranium arboreum	Puccinia callaquensis
glabratum	Puccinia geranii-silvatici
Gleichenia dichotoma	Helminthosporium gleicheniae
longissima	Dasyscypha ulei
	Leptothyrium gleicheniae
sp.	Leptothyrium gleicheniae
Gonocephalum serialum	Metarrhizium anisopliae
Gossypium	Glomerella gossypii
Gouldia coriacea	Asterina gouldiae
	Dendrophoma gouldiae
	Meliola sandwicensis
	Pluriporus gouldiae
elongata	Meliola sandwicensis
lanceolata	Meliola sandwicensis
	Meliola kaduae
	Septoria gouldiae
macrocarpa	Meliola sandwicensis
sp.	Enthallopycnidium gouldiae
	Meliola kaduae
	Meliola sandwicensis
	Mycosphaerella kaduae
	Septoria hawaiiensis
	Sphaeropsis gouldiae
terminalis	Meliola kaduae
	Meliola sandwicensis
Grass	Apiospora montagnei
	Fuligo septica
	Scirrhia lophodermioides
	Trichopeltis reptans
Guava, see Psidium	
Gunnera petaloidea	Harknessia gunnerae
	Mycosphaerella hawaiiensis
	Harknessia gunnerae
Cortaderia argentea	Apiospora montagnei
Hedychium coronarium	Mycosphaerella hedychii
Heliconia sp.	Phyllosticta heliconiae
Hemerocallis sp.	Phomopsis achillea
Heteropogon contortus	Puccinia versicolor
	Sphacelotheca monilifera
Hibiscus cult.	Microthyriella hibisci
sabdariffa	Fusarium radicicola
	Phoma macularis
Holchus halepensis	Puccinia purpurea
Hordeum sativum	Ustilago hordei
Hydrocotyle verticillata	Puccinia hydrocotyles
Ipomoea batatas	Fusarium solani
	Monilochaetes infuscans
	Rhizopus nigricans
	Septoria bataticola
bona-nox	Ramularia ipomoeae
	Sphaerulina ipomoeae

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Ipomoea insularis	Albugo ipomoeae-panduranae
pes-caprae	Cercospora alabamensis
Jussiaea villosa	Guignardia jussiaeae
Kadua glomerata	Polystomella kaduae
	Trichopeltis reptans
grandis	Septoria gouldiae
	Mycosphaerella kaduae
knudsenii	Meliola kauaiensis
	Meliola sandwicensis
sp.	Meliola kaduae
	Meliola kauaiensis
	Meliola sandwicensis
	Mycosphaerella kaduae
Kai choy, see Sinapis	
Koa, see Acacia	
Labordea sp.	Amazonia psychotriae
Lepidosaphes beckii	Ophionectria coccicola
	Sphaerostilbe coccophila
Litchi	Gloeosporium sp.
Lobelia sp.	Amazonia psychotriae
	Asterina fimbriata
	Asterina lobeliae
	Calothyriopeltis metrosideri
Lycopersicum esculentum	Septoria lycopersici
	Phytophthora infestans
Maba sandwicensis	Asterina aspidii
	Asterinella mabae
	Meliola sp. ind.
	Echidnodella mabae
hillabrandii	Asterinella mabae
Mangifera indica	Meliola sp. ind.
	Antennellina hawaiiensis
	Chaetothyrium mangiferae
	Glomerella cingulata
	Hypoxylon effusum
	Phaeosphaerella mangiferae
sp.	Gloeosporium sp.
Mango, see Mangifera	
Manihot	Gloeosporium sp.
Maranta dichotoma	Phyllosticta marantaceae
Mauna frigida	Laboulbenia hawaiiensis
Mecyclothorax montivagus	Laboulbenia hawaiiensis
ovipennis	Laboulbenia hawaiiensis
pusillus	Laboulbenia hawaiiensis
Medicago sativa	Pseudopeziza medicaginis
	Uromyces medicaginis
Mediola caroliana	Cercospora althaeina
Meliola sp.	Spegazzinia ornata
Mesothriscus alternans	Laboulbenia cauliculata hawaiiensis
collaris	cauliculata var. prolixa
hawaiiensis	cauliculata

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
musicola	hawaiiensis
	cauliculata
tricolor	cauliculata var. prolixa
	hawaiiensis
Metromenus aequalis	cauliculata var. prolixa
caliginosus	cauliculata var. spectabili
	sphyri
epicurus	sphyri
fraudator	cauliculata
latifrons	cauliculata var. spectabili
	sphyri
mutabilis	cauliculata var. spectabili
Metrosideros polymorpha	Amazonia ohianus
	Arcyria cinerea
	Diatrype princeps
	Metasphaeria hawaiiensis
	Mycosphaerella metrosideri
	Nummularia mauritanica
	Trichopeltis reptans
	Trichothallus hawaiiensis
collina polymorpha var (?)	Meliolina haplochaeta
collina polymorpha var incana	Meliolina sydowiana
sp.	Asterina rickii
	Calothyriopeltis metrosideri
	Penzigia globosum
	Xenolophium leve
	X. verrocosum
Microlepia sps.	Ramularia microlepiae
Monocrepidius exsul	Metarrhizium anisopliae
Morinda citrifolia	Chaetothyrium hawaiiensis
	Phaeoscaccardinula morindae
Musa sp.	Fusarium vasinfectum
	Gloeosporium musarum
	sp.
	Guignardia musae
	Pestalozzia sp.
	Phoma musae
	Phyllosticta musae
	musicola
	Pythium sp.
Myrsine sp.	Hendersonia nitida
Nephrolepis exaltata	Ramularia nephrolepis
Nerium oleander	Phyllosticta nerii
Nicotiana tabacum	Cercospora nicotianae
Notholcus lanatus	Puccinia rhamni
	Entyloma crastophilum
Nothopanax sp.	Colletotrichum peregrinum
Oat see Avena	
Oleander, see Nerium	
Omiodes accepta	Torrubiella
Opuntia sp.	Diplodia opuntiae
Orange, see Citrus	
Oryza sativa	Piricularia grisea
	Pythium butleri

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Osmanthus sandwicensis	Asterinella intensa
	Aulacostroma osmanthi
	Calothyriella osmanthi
	Calothyrium osmanthi
	Meliola osmanthi
Paederia foetida	Coleosporium paederiae
Palms	Meliola palmicola
Pandanus odoratissimus	Schizochora pandani
sp.	Melanconium pandani
Panicum barbinode	Uromyces leptodermus
nephelophilum	Puccinia esclavensis
Pantomorus fulleri	Metarrhizium anisopliae
Paspalum conjugatum	Leptosphaeria proteispora
	Sorosporium paspali
orbiculare	Puccinia huberi
Passiflora edulis	Colletotrichum passiflorae
laurifolia	Colletotrichum passiflorae
sp.	Botrytis sp.
Peach, see Prunus	
Peanut, see Arachis	
Pelea	Phragmocapnias smilicina
(on galls)	Gloeosporium peleae
barbigera	Meliola peleae
cinerea	Meliola juddiana
cinerea	M. peleae
clusiaefolia	Meliola juddiana
elliptica	juddiana
	peleae
hawaiiensis	juddiana
kauaiensis	Trichopeltis reptans
parvifolia	Meliola juddiana
rotundifolia	Hexagonella peleae
	Meliola juddiana
	peleae
sandwicensis	juddiana
	peleae
sp.	juddiana
	peleae
	Trichopeltis reptans
	Trichothallus hawaiiensis
Perkinsiella saccharicida	Cordyceps (sterile)
	Entomophthora sp.
	Sporotrichum sp.
Perrottetia sandwicensis	Actinodothis perrottetiae
	Amazonia perrottetiae
Persea gratissima	Fusarium radicicola
	Gloeosporium sp.
	Glomerella cingulata
Phaseolus (cult.)	Uromyces appendiculatus
	Colletotrichum lindemuthianaum
	Diaporthe phaseolarum
	Isariopsis griseola
Phoenix dactylifera	Graphiola phoenicis
Phyllocactus sp.	Colletotrichum phyllocacti

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Phyllostegia floribunda	Trichothallus hawaiiensis
sp.	Asterina phyllostegiae
Physalis peruviana	Irene inermis
Pineapple, see Ananas sativus	
Piperomia sp.	Trichopeltis reptans
Pipturus albidus	Cercospora pipturi
	Irene triloba
Pisonia umbellifera	Echidnodes pisoniae
sandmicensis	Echidnodes pisoniae
Pithecolobium saman	Phyllosticta pithecolobii
Pittosporum sp.	Rhabdospora pittospori
Plantago sp.	Cercospora plantaginis
Platydesma companulata	Clypeoseptoria rockii
Plusia chalcites	Metarrhizium anisopliae
Poa annua	Puccinia epiphylla
	Septoria poa-trivialis
Polestes sp.	Isaria saussurei
Polygonum glabrum	Puccinia polygoni-amphibii
Potato, see Solanum	
Pothos sp.	Leptothyrium pothi
	Phyllosticta aricola pothicola
Prosopis juliflora	Rhytidhysterium prosopidis
Prunus persica	Phyllosticta circumscissa
	Tranzschelia punctata
Pseudococcus sacchari	Aspergillus parasiticus
	Entomophthora pseudococci
Pseudolus hospes	Botrytis grassi
Psidium guayava	Aschersonia marginata
	Gloeosporium sp.
	Limaciniella psidii
	Trichopeltis reptans
Pteridium aquilinum	Uredinopsis pteridis
Puccinia versicolor	Darluca filum
Raillardia sp.	Echidnodella raillardiae
Rhabdocnemis obscura	Metarrhizium anisopliae
Rhynchospora lavarum	Uromyces rhyncosporae
thrysoidea	Meliola cyperi
Rice, see Oryza	
Rollandia crispa	Septoria rollandiae
racemosa	Limaciniopsis rollandiae
Rosa sp.	Mycosphaerella rosigena
	Phragmidium disciflorum
	Oidium (Sphaerotheca pannosa or S. humuli)
Roselle, see Hibiscus	
Rubiaceae	Meliola sandwicensis
Rubus hawaiiensis	Anomothallus erraticus
	Irene puiggarii
	Trichothallus hawaiiensis
villosus	Kuehneola uredinis
Saccharum officinarum	Acrothecium lunatum
	Allantospora radicicola
	Basisporium gallarum

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Saccharum officinarum	Cercospora sacchari
	vaginae
	Colletotrichum falcatum
	Gnomonia iliau
	Graphium sp.
	Himantia stellifera
	Hormiactella sacchari
	Leptosphaeria sacchari
	sp.
	Lophodermium sacchari
	Melanconium iliau
	sacchari
	Monilia sitophila
	Mycosphaerella striatiformans
	Nectria sps.
	Phyllosticta hawaiiensis
	Pythium butleri
	Rhizoctonia sp.
	Sclerotium rolfsii
	sp.
	Strumella sacchari
	Thielaviopsis paradoxa
	Trichoderma lignorum
Sadleria sp.	Dasyscypha sadleriae
Sagittaria sagittifolia	Cercospora sagittariae
Salvia coccinea	Septoria salviae-pratensis
Scaevola chamissoniana	Irene scaevolicola
	Mycosphaerella scaevolae
	Phyllosticta scaevolae
	Pleospora scaevolae
glabra	Amazonia psychotriae
	Irene scaevolicola
	Mycosphaerella scaevolae
mollis	Irene scaevolicola
	Mycosphaerella scaevolae
Scaevola sp.	Amazonia psychotriae
	Calothyriopeltis scaevolae
	Trichothallus hawaiiensis
Scale insects	Nectria subcoccinea
Scirpus paludosus	Uromyces scirpi
Scotytids	Botrytis grassi
Sedge	Metasphaera cumana
	Trichothallus hawaiiensis
see also Carex	
Semnoprepia sp.	Sporotrichium sp.
Sida sp.	Colletotrichium malvarum
spinosa	Leptothyrium sidae
Sideroxylon rhynocospermum	Pauahia sideroxyli
sandwicense	Meliola sideroxyi
Sinapis cernua	Albugo candida
Siphanta acuta	Cordyceps (sterile)
Smilax	Phargmocapnias smilicina
	Trichothallus hawaiiensis
S. sandwicensis	Trichopeltis reptans
	Macrophoma smilacini

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Solanum melongena	Phomopsis vexans
sp.	Gibberella pulicaris
tuberosum	Alternaria solani
	Fusarium coeruleum
	oxysporum
	radicicola
	Phytophthora infestans
	Rhizoctonia solani
	Sclerotium rolfsii
Sonchus oleraceus	Alternaria sonchi
Sorghum	Sphacelotheca reiliana sorghi
Sporobolis elongatus	Helminthosporium ravenelii
Stachytarpheta dichotoma	Phoma herbarum
Star-apple	Gloeosporium sp.
Stenommatus musae	Botrytis grassi
Straussia hawaiiensis	Amazonia psychotriae
kaduana	Amazonia psychotriae
	Meliola kaduae
mariniana	Amazonia psychotriae
	Chaetothyrium straussiae
sp.	Amazonia psychotriae
	Meliola kaduae
	Trichopeltis reptans
	Trichothallus hawaiiensis
Strawberry, see Fragaria	Lyonella neurophila
Suttonia kauaiensis	Actinodothis suttoniae
lessertiana	Actinodothis suttoniae
	Trichopeltis reptans
lanaiensis	Beelia suttoniae
	Oligostroma suttoniae
sandwicensis	Calothyrium suttoniae
sp.	Asterina suttoniae
	Meliola sp. ind.
Sweet potato, see Ipomoea	
Syntherisma pruriens	Puccinia oahuensis
Taraxacum officinale	Puccinia taraxaci
Taro, see Colocasia	
Tectonia grandis	Cercospora tectoniae
Tetraplasandra hawaiiensis	Seynesiopeltis tetraplasandrae
meiandra	Seynesiopeltis tetraplasandrae
Tobacco, see Nicotana	
Tomato, see Lycopersicum	
Triticum (cult.)	Puccinia clematidis
Turnip, see Brassica	
Uromyces leptodermus	Darluca filum
Uromyces rhyncosporae	Darluca filum
Vaccinium reticulatum	Irene exilis
	Meliola alyxiae
	vaccinii
	Pucciniastrum myrtilli
	Trichopeltis reptans
sp.	Asterina delitescens

HOSTS OF HAWAIIAN FUNGI AND THE FUNGI ON THEM—*Continued*

HOST	FUNGUS
Vanilla	Gloeosporium sp.
Verbena sp.	Cicinnobolus cesatii
Vigna catjang	Uromyces appendiculatus
Vincentia augustifolia	Lophodermium arundinaceum
	Meliola cyperi
	Pestalozzia sp.
	Trichopeltis reptans
	Trichothallus hawaiiensis
Viscum articulatum	Meliola visci
Wikstroemia elongata	Amazonia psychotriae
foetida var. oahuensis	Amazonia psychotriae
phillyreaefolia	Amazonia psychotriae
sp.	Amazonia psychotriae
uva-ursi	Pucciniastrum wikstroemiae
Wood	Fuligo cinerea var. escorticata septica
	Hypoylon sandwicensis
	Lycogala epidendrum
	Rosellina citriformis
	Stemonitis splendens
	Ustulina zonata
(rotten)	Xylaria hypoxylon
Xanthium italicum	Oidium
	Puccinia xanthii
Zangiber zerumbet	Phyllosticta zingiberis
Zinnia	Oidium (Erysiphe cichoracearum)

HOSTS OF HAWAIIAN MELIOLAS BY FAMILIES

Rutaceae:
Pelea barbigera, cinerea, elliptica, rotundifolia, sandwicensis, and Pelea species **M. peleae**
Pelea cinerea, clusiaefolia, elliptica, hawaiiensis, parvifolia, rotundifolia, sandwicensis, and P. species **M. juddiana**

Celastraceae:
Perrottetia sandwicensis **Am. perrottetiae**
Perrottetia sandwicensis **Ac. perrottetiae**

Rhamnaceae:
Alphitonia excelsa **I. splendens**

Sapindaceae:
Dodonaea viscosa **M. lyoni**

Leguminosae:
Acacia koa **M. koae**

Rosaceae:
Rubus hawaiiensis **I. puiggarii**

Myrtaceae:
Eugenia sandwicensis **M. hawaiiensis**
Meterosideros collina polymorpha **Me. haplochaeta**
Meterosideros collina polymorpha **Me. sydowiana**
Meterosideros polymorpha **Am. oahianus**

Araliaceae:
Cheirodendron gaudichaudii **I. cheirodendronis**

Rubiaceae:
Coprosma species, Straussia hawaiiensis, kaduana, mariniana and Straussia species **Am. psychotriae**
Gouldia coriacea, elongeata, lanceolata, macrocarpa, terminals and G. species, Kadua knudsenii, K. species **M. sandwicensis**
Kadua knudsenii, Kadua sps **M. kauaiensis**
Gouldia terminalis, Gouldia lanceolata, Gouldia sp., and Kadua sp., Straussia kaduana and Straussia species **M. kaduae**

Lobeliaceae:
Clermontia multiflora, C. species, Lobelia sps **Am. psychotriae**
Clermontia sp **M. lobeliae**

Goodeniaceae:
Scaevola chamissoniana, glabra, mollis, S. species, ... **I. scaevolicola**
Scaevola glabra, S. species **Am. psychotriae**

Vacciniaceae:
Vaccinium reticulatum **M. vaccinii**
Vaccinium reticulatum **I. exilis**
Vaccinium reticulatum **M. alyxiae**

Ebenaceae:
Maba sandwicensis **M. sp. ind.**

Sapotaceae:
Sideroxylon sandwicense **M. sideroxyli**

Myrsinaceae:
Suttonia lessertiana, Suttonia kauaiensis **Ac. suttoniae**
Suttonia sps **M. sp. ind.**

HOSTS OF HAWAIIAN MELIOLAS BY FAMILIES—*Continued*

Loganaceae:
Labordea sp.....**Am. psychotriae**

Apocynaceae:
Alyxia olivaeformis.....**M. alyxiae**
Alyxia olivaeformis.....**Am. psychotriae**

Oleaceae:
Osmanthus sandwicensis.....**M. osmanthi**

Solanaceae:
Physalis peruviana.....**I. inermis**

Gesneriaceae:
Cyrtandra cordifolia, lessoniana.....**I. cyrtandri**

Lauraceae:
Cryptocarya mannii.....**M. peleae**

Thymelaeaceae:
Wikstroemia elongata, foetida, phillyreaefolia and W. sp.....**Am. psychotriae**

Loranthaceae:
Viscum articulatum.....**M. visci**

Euphorbiaceae:
Euphorbia clusiaefolia.....**Am. psychotriae**
Claoxylon sandwicense.....**M. morbosa**

Urticaceae:
Pipturus albidus.....**I. triloba**

Liliaceae:
Dianella odorata.....**M. gregoriana**
Dracaena aurea.....**M. dracenae**

Palmaceae:
Palms.....**M. palmicola**

Cyperaceae:
Rhynchospora thyrsoidea, Baumea meyenii, Gahnia leptostachya, gaudichaudii, Vincentia angustifolia.....**M. cyperi**

HOSTS OF HAWAIIAN RUSTS INDICATING THE ENDEMIC (e), THE INDIGENOUS (i), AND THE RECENT (r)

An asterisk indicates that the rust also is endemic [a]

Acacia farnesiana (r)
Acacia koa * (e) (i)
Abutilon incanum (e) (i)
Abutilon menziesii (e) (i)
Ageratum conyzoides (r)
Alyxia olivaeformis * (e) (i)
Avena sativa (r)
Capriola dactylon (r)
Carex oahuensis * (e) (i)
Cenchrus hillibrandianus (e) (i)
Chrysanthemum indicum (r)
Dianthus (cult.) (r)
Euphorbia clusiaefolia * (e) (i)
Euphorbia cordata * (i)
Euphorbia hookeri * (e) (i)
Euphorbia serphyllifolia (r)
Geranium glabratum (i)
Geranium arboreum (i)
Heteropogon contortus (r)
Holchus halepensis (r)
Holchus sorghum (r)
Hydrocotyle verticillata (i)
Medicago sativa (r)
Notholcus lanatus (r)
Paederia foetida (r)
Panicum barbinode (r)
Panicum barbinode
Paspalum orbiculare (i)
Phaseolus (cult.) (r)
Poa annua (r)
Polygonum glabrum (i)
Prunus persica (r)
Pteridium aquilinum (i)
Rhynchospora lavarum
Rosa sp. (r)
Rubus villosus (r)
Scirpus paludosus (i)
Syntherisma pruriens (i)
Taraxacum officinale (r)
Triticum (cult.) (r)
Vaccinium reticulatum (e) (i)
Vigna catjang (r)
Wikstroemia uva-ursi * (e) (i)
Xanthium italicum (r)

a See p.

SPECIES OF HAWAIIAN RUSTS INDICATING THE APPROXIMATE SOURCE (e) ENDEMIC, (r) RECENT, (E) PROBABLE AMERICAN ORIGIN, (W) PROBABLE WESTERN ORIGIN, (ew) UNCERTAIN ORIGIN

alyxiae Uromyces (e)
appendiculatus Uromyces (e w) (r)
callaquensis Puccinia (E) (*)
caryophyllinus Uromyces (e w) (r)
cenchri Puccinia (E) (*)
chrysanthemi Puccinia (e w) (r)
clematidis Puccinia (e w) (r)
conoclinii Puccinia (E) (r)
cynodontis Puccinia (e w) (r)
disciflorum Phragmidium (e w) (r)
epiphylla Puccinia (e w) (r)
esclavensis Puccinia (E) (*)
geranii-sylvatica Puccinia (e w) (*)
hawaiiensis Uredo (e)
heterospora Puccinia (e w) (*)
huberi Puccinia (E) (*)
hydrocotyles Puccinia (E) (*)
koae Uromyces (e)
leptodermus Uromyces (E) (r)
medicaginis Uromyces (E) (r)
myrtilli Pucciniastrum (e w) (*
oahuensis Puccinia (e)
paederiae Coleosporium (W)
polygoni-amphibii Puccinia (e)
proeminens Uuromyces (e w) (r)
pteridis Uredinopsis (E) (*)
punctata Tranzchelia (e w) (r)
purpurea Puccinia (e w) (r)
rhamni Puccinia (e w) (r)
rhyncosporae Uromyces (E) (*
scirpi Uromyces (E)
siliquae Ravenelia (E) (r)
stevensii Uredo (e)
taraxici Puccinia (e w) (r)
uredinis Kuehneola (E) (r)
velata Puccinia (e)
versicolor Puccinia (E) (r)
wikstroemiae Pucciniastrum (e)
xanthii Puccinia (E) (r)

a For explanation see pp.
* Probably indigenous.

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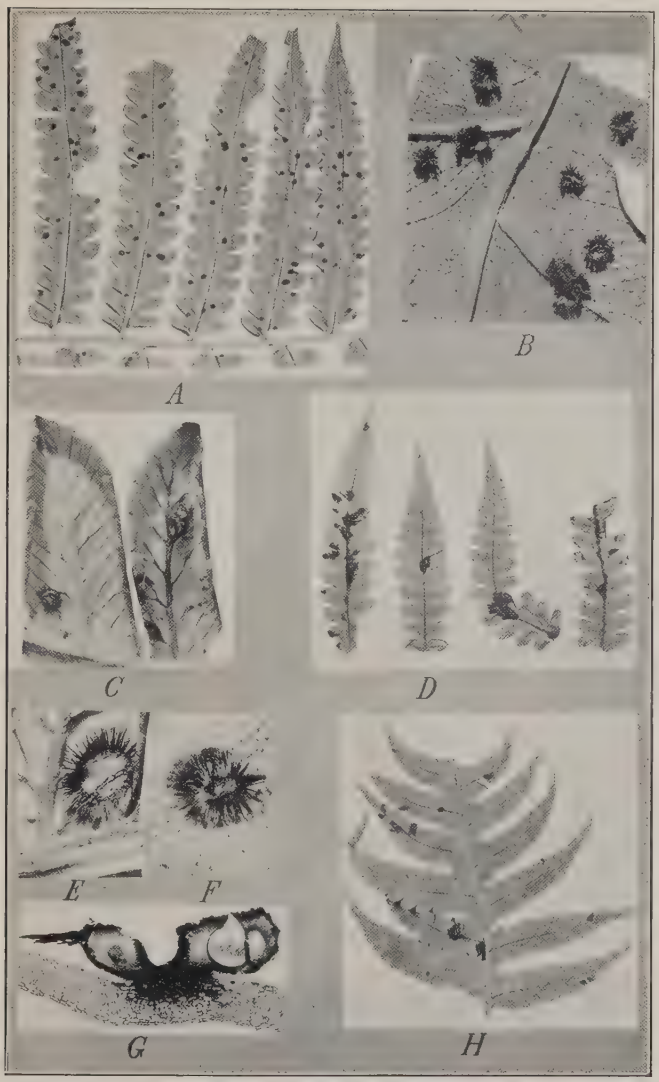
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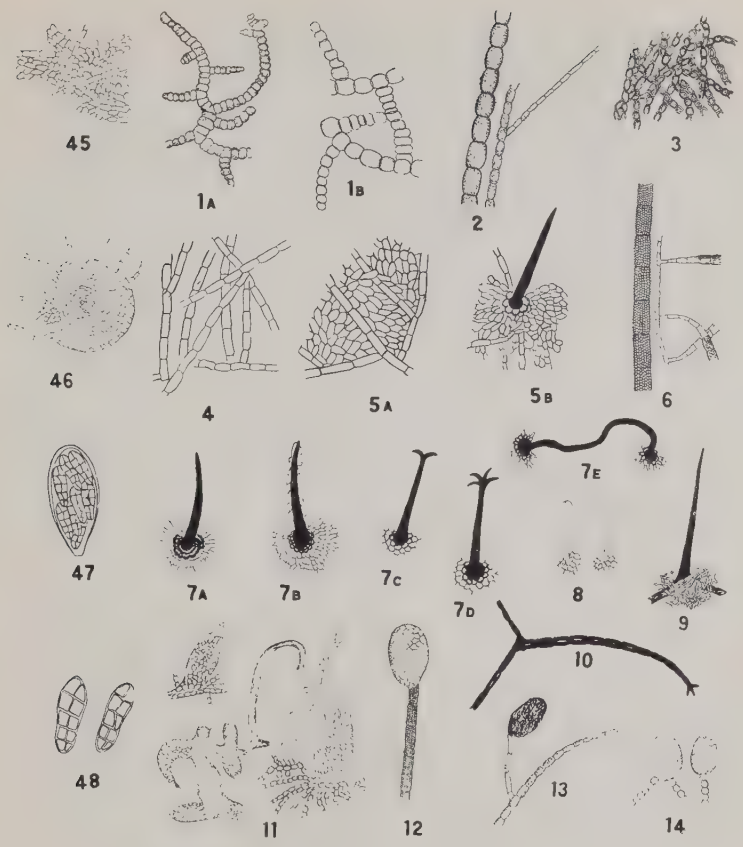
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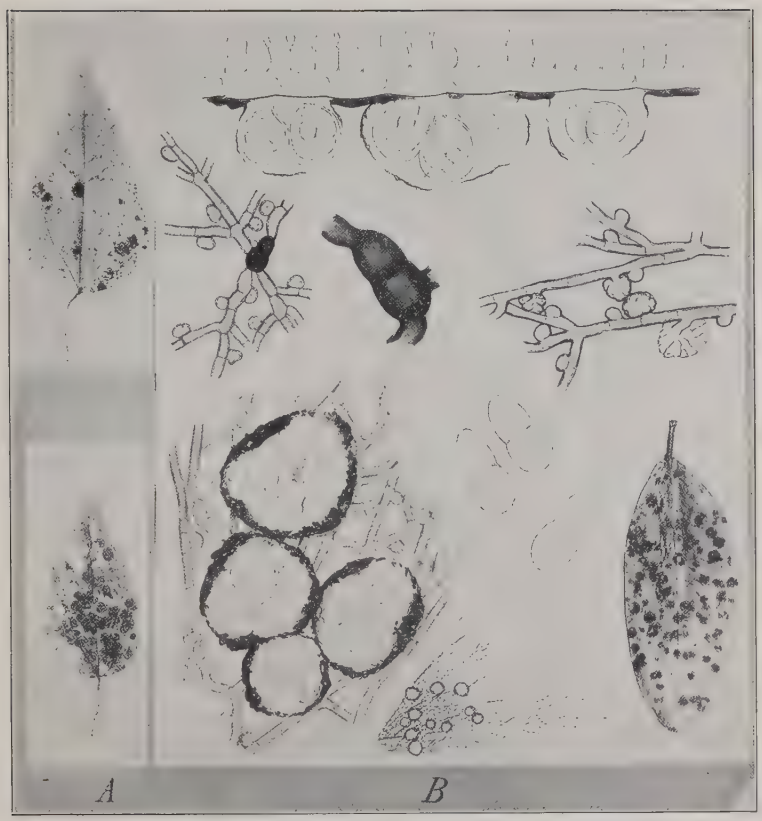
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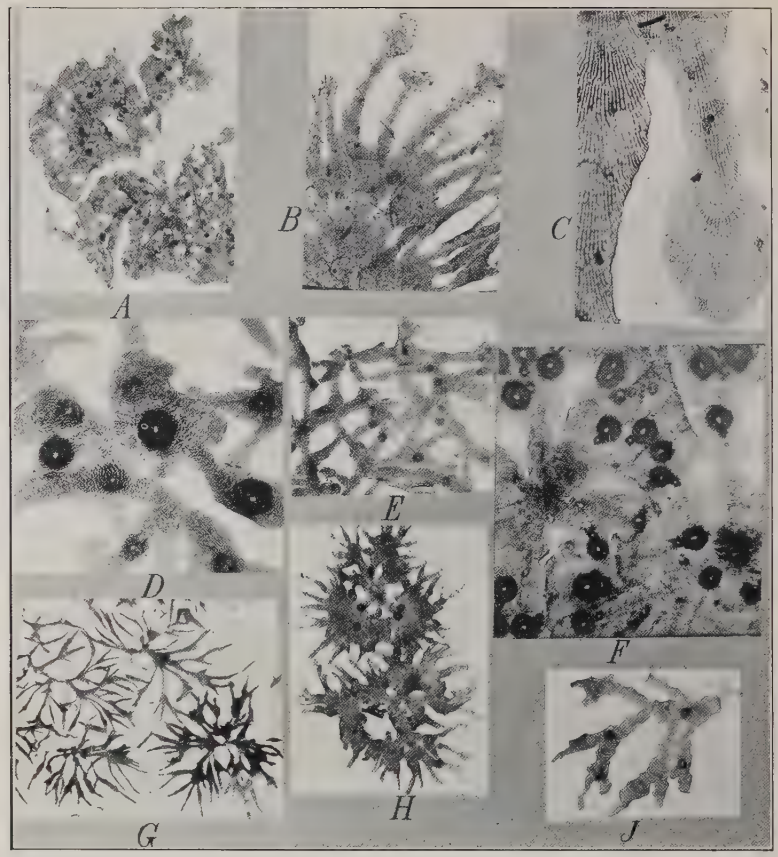
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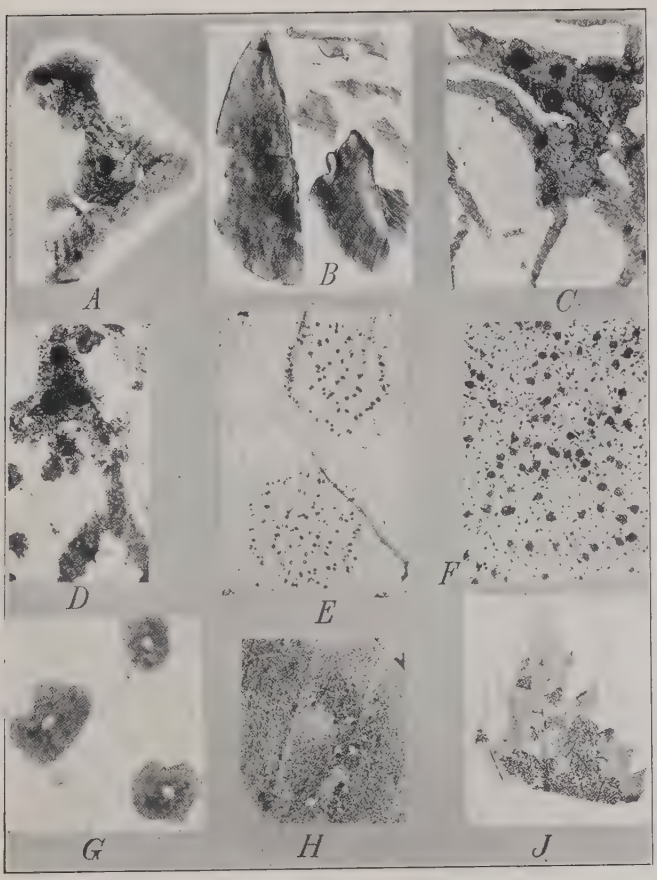
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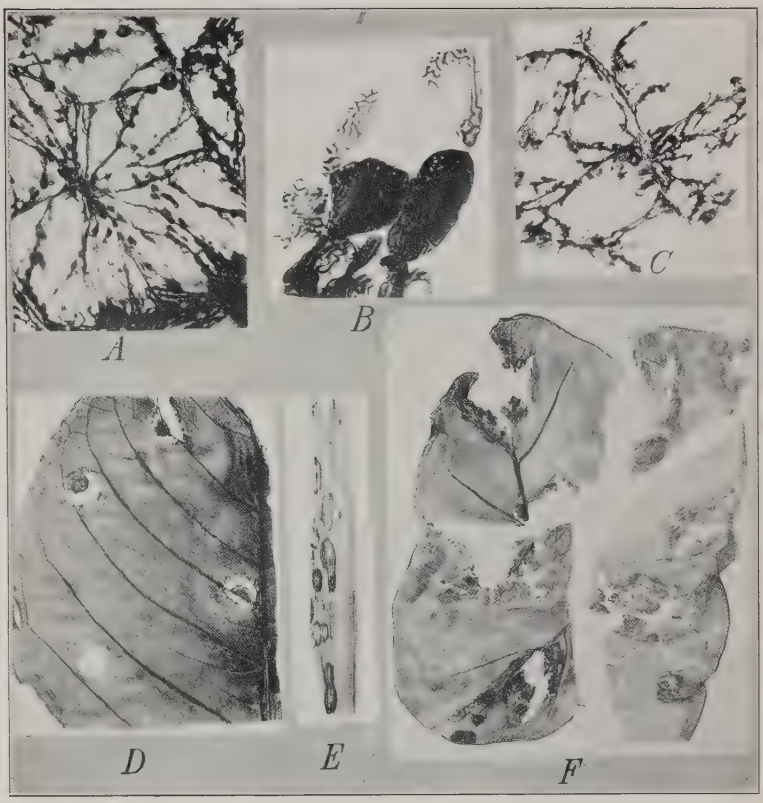
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TRICHOPELTIS: A-F, T. REPTANS: A, (NO. 777) ON METROSIDEROS SP.—LARGE THALLI SHOWING TRANSITION FROM ENTIRE, CIRCULAR TYPE TO STRAP-SHAPED TYPE AND CHANGE BACK AGAIN TO THE CIRCULAR TYPE; B, (NO. 1071) ON METROSIDEROS, SHOWING CENTRAL PORTION OF A THALLUS CONSISTING OF A SOLID PLATE, THE MARGIN OF BANDS AND LOBES; C, DETAIL OF A SINGLE LOBE OF THE THALLUS SEEN IN B, SHOWING CELL ARRANGEMENT: D, (NO. 1054) ON STRAUSSIA SPS.—DETAIL OF PORTION OF A THALLUS SHOWING GENERAL OUTLINE, CELL ARRANGEMENT AND PERITHECIA OF DIFFERENT AGES; E, (NO. 338) ON CLERMONTIA SP., SHOWING BRANCHING OF THALLUS AND FORMING OF PERITHECIA; F, (NO. 1054) ON STRAUSSIA SPS., SHOWING CENTRAL PORTION OF A LARGE THALLUS THAT HAD BOTH ENTIRE AND BAND TYPES, AND PERITHECIA OF DIFFERENT AGES; G, T. RHYACOIDES (NO. 985) ON ALYXIA OLIVAEFORMIS, SHOWING TYPE OF THALLUS; H, T. REPTANS (NO. 1071) ON METROSIDEROS, SHOWING THALLUS WITH CIRCULAR CENTER AND WITH BANDS RADIATING; J, T. REPTANS (NO. 1054) ON STRAUSSIA SPS., SHOWING THALLUS OF NARROW BAND TYPE AND PERITHECIA OF DIFFERENT AGES.



A, TRICHOPELTIS REPTANS—PHOTOMICROGRAPH OF A PORTION OF A THALLUS OF SPEGAZZINI'S SPECIMEN OF NO. 734, FUNGI CUBENSES WRICHTIANI; B, T. REPTANS—PHOTOGRAPH OF THE MATERIAL IN NO. 734, FUNGI CUBENSES WRIGHTIANI; C, T. PULCHELLA—PHOTOMICROGRAPH OF PART OF SPEGAZZINI'S SPECIMEN NO. 2365; D, T. CHILENSIS—PHOTOMICROGRAPH OF SPECIMEN FROM SPEGAZZINI'S COLLECTION.—E-J, MICROTHYRIELLA, HEXAGONELLA, AND ANOMOTHALLUS: E, MICROTHYRIELLA HIBISCUS (NO. 100) ON HIBISCUS, GIVING GENERAL VIEW OF TWO CLUSTERS OF SPOTS MUCH ENLARGED; F, SAME AS E, SHOWING PERITHECIA WITH STILL GREATER ENLARGEMENT; G, THREE PERITHECIA; H, HEXAGONELLA PELEA (NO. 248) ON PELEA ROTUNDIFOLIA—THE SMALL BLACK DOTS ARE THE FRUITING THALLI; J, ANOMOTHALLUS ERRATICUS (NO. 1055) ON RUBUS HAWAIENSIS, SHOWING HABIT ON LEAF.



A—C, ANOMOTHALLUS ERRATICUS (NO. 1055) ON RUBUS HAWAIIENSIS: A, SHOWING SEVERAL PERITHECIA AND GENERAL HABIT OF THE THALLUS AND BANDS (WITH IRREGULAR LOBES), MANY RADIATING FROM A CENTER; B, PORTIONS OF A THALLUS SHOWING CELL STRUCTURE (COMPARE WITH TEXT FIGURES); C, ANOTHER COLONY SHOWING THE TENDENCY, WHICH IS COMMON, TO FOLLOW THE VEINLETS, SENDING OFF BRANCHES AT RIGHT ANGLES TO THE COURSE OF THE VEIN; D, SEPTORIA ROLLANDIAE (NO. 706) ON ROLLANDIA CRISPA; E, MYCOSPHAERELLA DIANELLAE ON DIANELLA ODORATA; F, PHYLLOSTICTA COLOCASIOPHILA (NO. 873) ON COLOCASIA (TARO), SHOWING CHARACTER OF THE SPOTS ON THE LEAVES.